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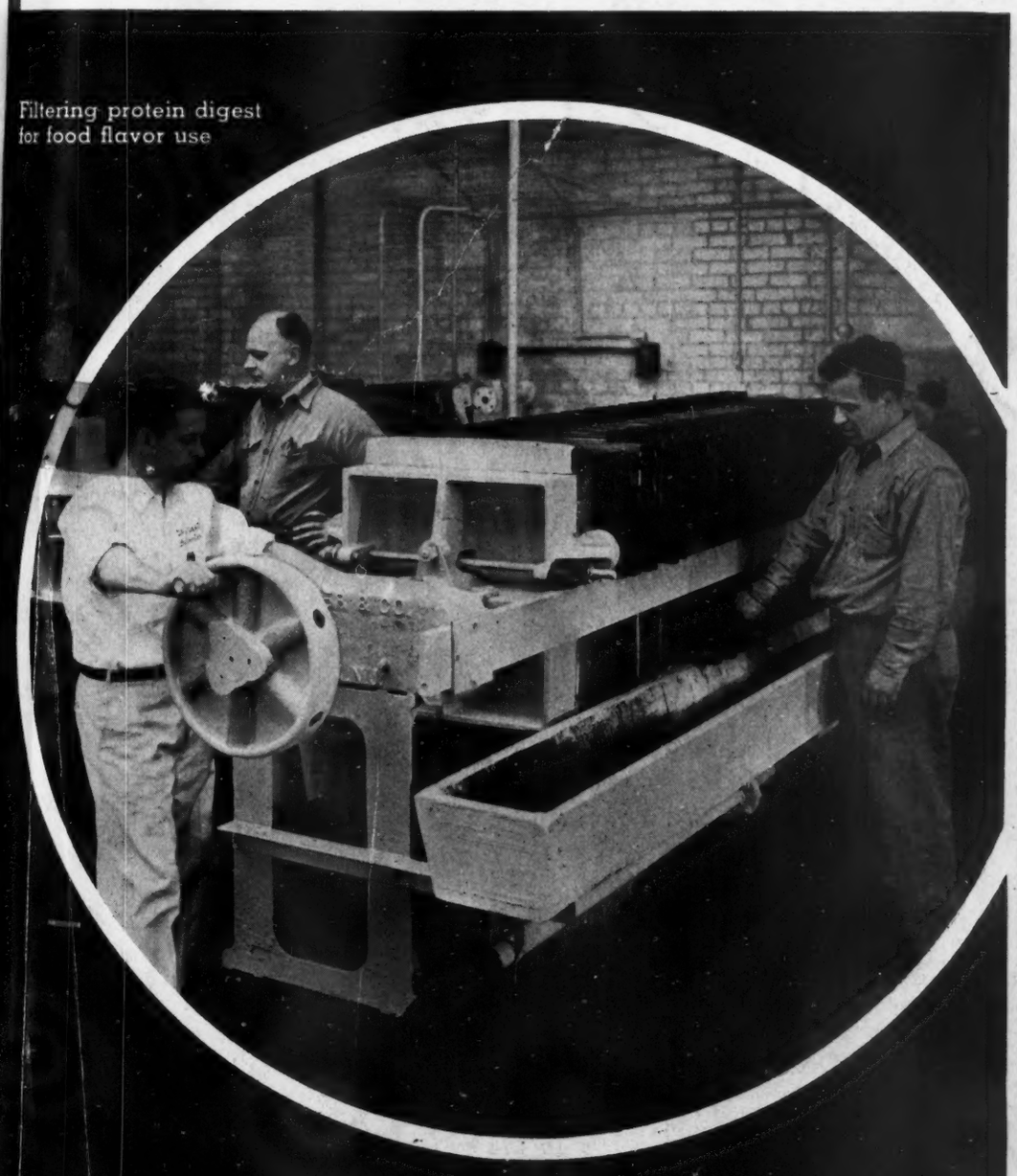
# FOOD INDUSTRIES

## ● FOR THOSE WHO CONTROL QUALITY THROUGH MANAGEMENT AND PRODUCTION



Filtering protein digest for food flavor use

MAY 1946

Report on Meeting of IFT

Freezing Foods in Liquid Nitrous Oxid

Food Preservation By Dehydrofreezing

Protein Hydrolysate —Flavor Ingredient

New Market for American Food

Processing Frozen Orange Juice

Corn Starch—A Versatile Comm

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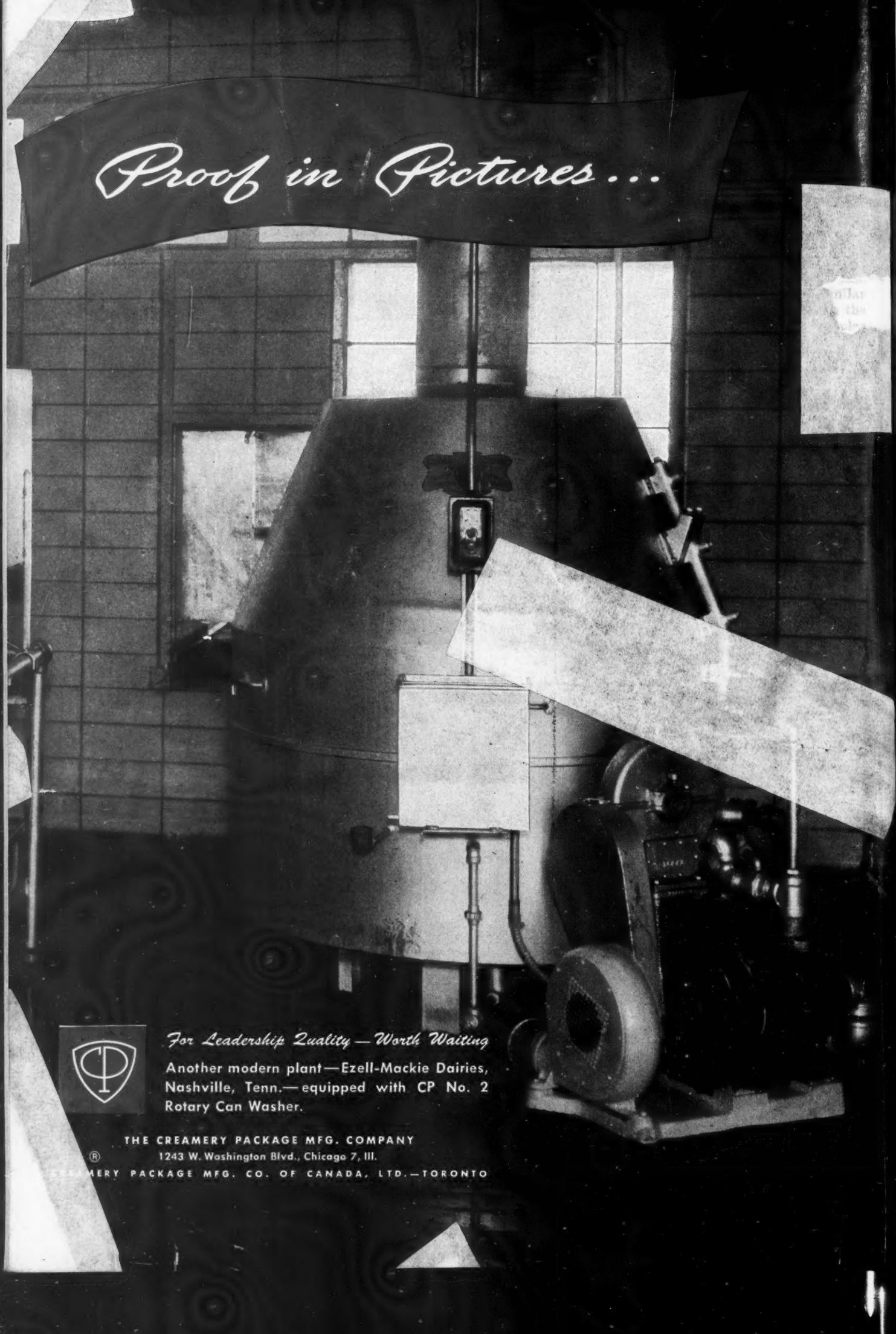


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Hydrolysates, prepared by acid digestion of common proteins, are decolorized with charcoal, then filtered, as shown. Amino acid product obtained in this way is used as a meat flavoring in foods. See page 95.

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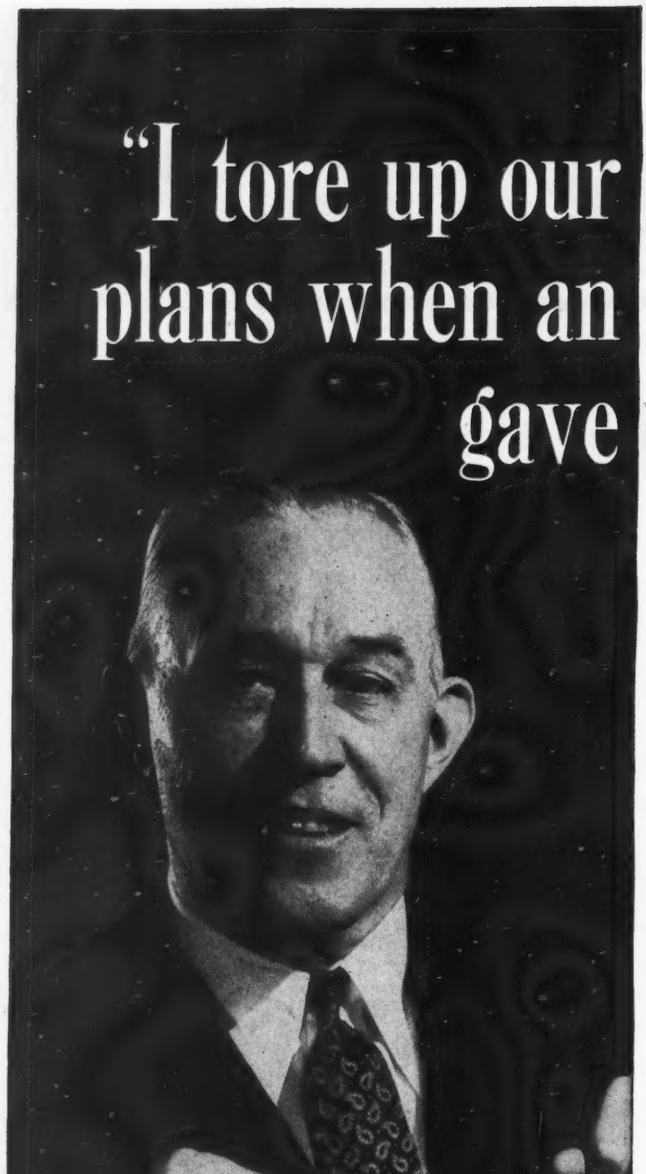

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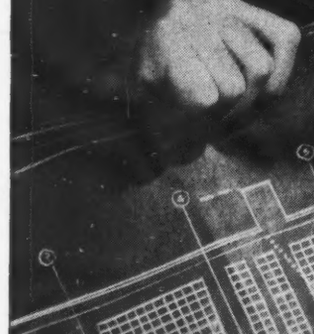


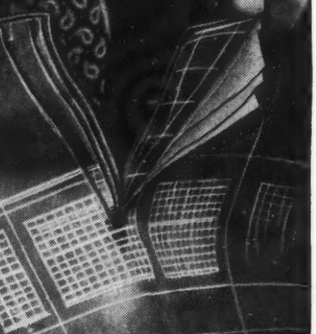

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# Brutal Facts About Freezing

JUDGING by inquiries, the frozen food "industry" has been greatly oversold to the lay public. Do not misunderstand that sentence. Frozen foods have received too much *romantic* publicity. Many are preparing to go off the deep end into a business that is beyond their economic and technical resources.

### Freezing Is Not "Duck Soup"

What FOOD INDUSTRIES once remarked about dehydration—that dehydration is not "duck soup"—should be repeated with greater emphasis about quick freezing. This is not intended to discourage qualified firms or individuals. On the contrary, the frozen food field needs them. Men of proper technological training and experience often command surprisingly large salaries.

The inexperienced returning veteran is the predominant candidate for entry into the frozen food business at the retail level. But the veteran group is almost equalled by the number of established business men who believe it would be smart to get into this rapidly growing field, regardless of prerequisite qualifications. Each has been oversold by the publicity that has glamorized the marvels of the food future.

It is distasteful to be a killjoy about frozen foods —especially when they are due for an important expansion. Yet, with the following examples of enthusiasm without suitable technical qualifications, it would appear that prudence, imposed by knowledge of the facts, would be very much in order.

1. The top financial man of a sizeable food company that has neither research nor engineering staffs asked help to lay out a "factory" for the production of a frozen cooked item. When asked what volume he desired to produce, he gravely responded: "It is a big operation. We want to produce 120 quarts a day."

2. An inquiry for a formula for a sauce to use with sea foods prepared for frozen ready-to-eat meals.

3. "I am going into the retailing of frozen foods. Please send by return mail full information about promising locations, expected profit margins, and sources of merchandise and equipment, etc. Thanking you in advance."

Such inquiries indicate a hopeless void.

### No Frozen Food "Industry"

There is no such thing as a true frozen food "industry" up to now. Freezing is merely one of several methods of preservation. Some food manufacturers use freezing in addition to some other method of preservation, usually canning. In the line that includes the biggest volume of frozen foods, vegetables, there are almost no firms that freeze to the exclusion of all other forms of preservation. And only a handful of firms freeze fruit without also canning. Precooked frozen foods are usually a side line for all but a very few manufacturers.

Freezing is at present the most profitable, as well as the most costly, method of preserving top quality foods. Freezing is only the last step in the manufacture of frozen foods. Either you know how to do a good job of manufacturing or you don't. If you don't know your stuff, freezing won't do anything but add to your costs and your headaches.

Trade gossip has it that one of the recent entrants into the frozen precooked field is in the red by something over six figures.

Working capital requirements are large. Not long ago General Foods Corporation discovered that its Birds Eye Frosted Foods Division alone took as much working capital as all the rest of the corporation.

### Balance and Quality Needed

At the present time the demand for frozen foods (vegetables, fruits and the like) exceeds the supply. The biggest problem for newcomers in distribution of frozen foods will be procurement of a balanced line of suitable quality.

Also there are tales of certain lots of precooked frozen foods in warehouses where not a single case has been ordered out for a year. Something must be wrong there.

Production or the distribution of frozen foods, either primary or fabricated, is a difficult business. With the requisite training and ability it is a splendid opportunity. Without such training and experience one would do well to enter it only as an employee.

There is no magic in freezing. It is the highest cost method of food preservation or distribution. If the quality of the food will carry such a cost, it will pay off—well. If not, the unwise or unwary may take the shellacking of his life.

H. V. Burton EDITOR

# The Talk of the Industry

• SPEAKING of WFO 144, what has become of Henry Wallace's ever-normal granary?

• THE fifth report of the director of War Mobilization and Reconversion, John W. Snyder, says, "The basic need at this particular time to meet both situations (inflation and rising unemployment) is more production." Which sounds strangely like 1919.

He makes a good case for farm subsidies as preferable to support prices. "The direct-payment method is not a cure-all, but I believe it does have specific advantages in some cases. It would eliminate the danger of spoilage of surpluses and the piling up of large stocks in government warehouses." Evidently Mr. Snyder was not enthusiastic about the spoilage and cost of storing eggs in the limestone cave in Kansas.

• VARIOUS friends have urged us to keep on slugging (verbally, of course) those labor leaders who have incurred their displeasure. Some have even admonished us when the tone of our remarks was not sufficiently belligerent. Once we were severely taken to task for what was erroneously called a "forgive them, they know not what they do" manner.

• IF verbal slugging is what the cash customers like to pay $3.00 a year to read, probably that's what they ought to get. But unfortunately John L. Lewis, Walter P. Reuther, James Carey, Philip Murray and the lesser hot-heads do not read FOOD INDUSTRIES. Shadow boxing is about as effective as a session in a country club near Hyde Park, N. Y., in 1934, when a group of owners of nearby estates nearly had apoplexy about that man.

• ADVOCATES of a centralized government planned economy will have plenty to masticate when considering subsidies, ceilings, support prices, wage increases, public doles for strikers, and the like. A hodge-podge, more confused than exists today, is difficult to envision, but we believe if we wait a little longer we shall see it.

• THE tendency to blame Mr. Truman for all the confusion in Washington is unfair. Admittedly, he is unable to straighten out the mess and frequently makes it worse. But if you want to attack the more responsible parties, go after Congress. Ever since 1933 it has been piling contradiction on inconsistency. Take sugar: We can't pay Cuba the price it wants because we must hold U. S. prices below ceilings, because the cost of living must be controlled, because if it is not controlled labor will demand higher wages. But labor strikes anyway, because of the Wagner Act, that Congress enacted.

• HOW times change! Only a few years ago exhibitors used to say that they never expected to make sales at machinery shows. Now they exhibit to explain why deliveries are slow.

• H. J. HEINZ II, who has been about the world a bit during the war, has been conducting a commendable one-man ad campaign against the famine abroad by urging food conservation at home. His prompt reaction to the proclamation of world food shortage bespeaks a first hand knowledge of the tragic conditions overseas.

• DO YOU recall the International Economic Congress held in the early thirties? One of the big problems of that day was what to do with the world surplus of food. A famous German economist stated that the world had never previously been more than 90 days ahead of starvation. During the great depression the world was 180 days ahead of hunger which, he claimed, was the basic cause of the world wide economic crisis.

According to present indications, the world food supply is down to about 45 days. Too little is as bad as too much.

# Hors d'Oeuvres

• Stewed ox cheeks, canned before 1852 and reported to be "still wholesome," have been found cached away in the Arctic. At long last the ox cheek canning industry learns what became of its product.

• *The Puritan Fruit Products Co. has changed its name to The Puritan Co. of America. In a way, it seems almost too bad that Mayflower Doughnut Corp. is already tied up with the Maxwell House in the operation of those retail outlets.*

• The U. S. Brewers' Foundation recalls a news item of 20 years ago, which stated that "twenty-four hundred pounds of chocolate bonbons, loaded with whiskey, were seized in two raids by prohibition agents in New York." To the shortage-minded World War II generation it should be pointed out that it was the whiskey that was being seized.

• *An electric clock, now on the market, can be set in advance to tune in radio programs automatically for ten hours. Tell 'em about the stork if you want to, but spare the children from inventions such as this.*

• On a gray day in March the Loose-Wiles Biscuit Co. decided to make things easier all around by becoming Sunshine Biscuits, Inc. This move has been expected ever since they opened that plant in California, in 1941.

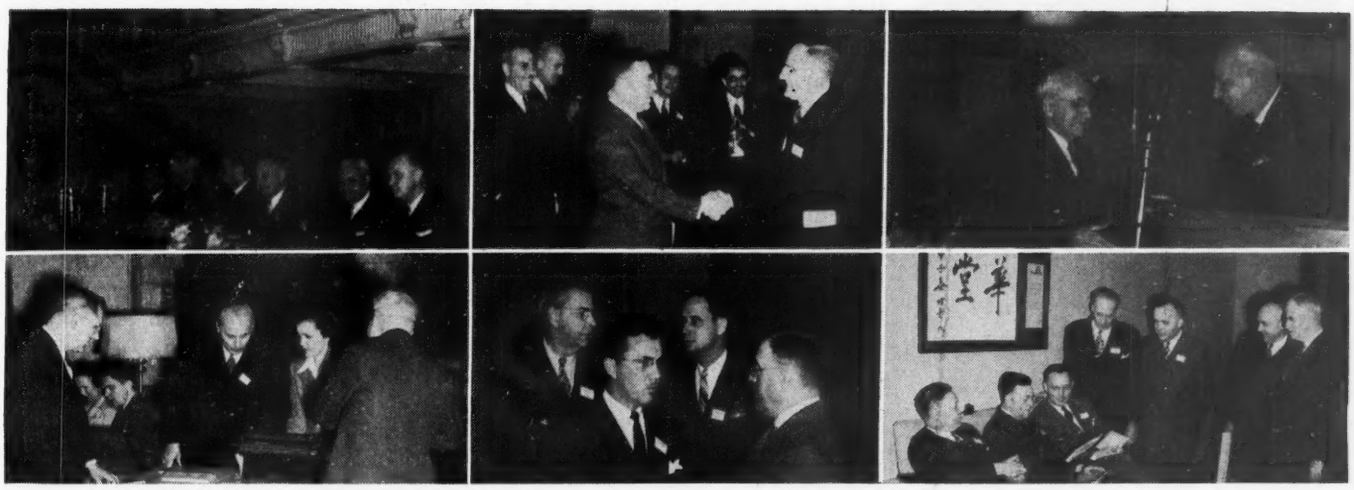
• *A vegetable packing plant with only a floor has been put into operation down in McAllen, Tex. Construction stopped at that point, but the plant operator didn't. He just moved in the equipment, strung some lights for moonless night work and brought in the help. If you have any questions, the man's name is George A. Eby, Jr. Write to him, not to us.*

• A War Department release says "Army Saves Flour by Serving Less Bread More Frequently." It's all done by serving fewer hot rolls more seldom and 120 pieces of cornbread to 100 men as long as the 80 stuck with one piece squawk less often more.

• *"A good corkscrew is the wine lover's best friend and the rarest of tools," says an article in the English publication, "Ridley's Wine & Spirit Trade Circular." This is the most alarming reaction we have yet had to the hand tool shortage in England.*

• Think of England's consternation when they learn that our own Wine Institute in San Francisco is preparing a full report on tests and recommendations for the production of better corkscrews, "that will enable waiters and householders to get the corks out of wine bottles without annoyance." Thus, the great new world clashes with the mellow old world on a fundamental issue.

J.A.J.J.



Top row: Left: Speakers' table at banquet, right to left: Secretary-Treasurer G. J. Hucker; Former Presidents L. V. Burton and R. C. Newton; K. G. Dykstra, chairman western New York Section; Bradley Dewey, Dewey & Almy Chemical Co., and president American Chemical Society; F. W. Tanner, outgoing president, IFT; C. H. Bailey, Nicholas Appert medalist, and R. V. Wilson, chairman Chicago section. Center: President Tanner congratulates President-elect E. H. Harvey. Right: R. V. Wilson presents 1946 Nicholas Appert Medal to Dr. Clyde H. Bailey, University of Minnesota. Bottom row: Left: Standing, Dr. L. W. Haas, W. E. Long Co., Chicago; Dr. C. S. Pederson, New York State Agricultural Experiment Station, Geneva; Mrs. Marion Davis, assistant to IFT secretary, and Dr. S. C. Prescott. Center: President Tanner talks with R. D. Gerwe, Food Machinery Corp. R. B. McKinnis appears to be between them. Right: R. C. Newton, President Tanner, Aksel G. Olsen, C. O. Ball, J. A. Dunn, Carl S. Pederson and S. C. Prescott.

# IFT MEETS AGAIN

**The first gathering in two years helps to clarify many of the wartime developments in food technology as well as to point up some of the problems facing the industry as a whole during these first peacetime years**

GETTING down to long range peacetime problems for the first time since the War's end, the Institute of Food Technologists held its 6th annual conference at Buffalo, March 17 to 20. The registration, totalling close to 700, heard one of the most varied programs in the history of the conference, beginning with a Sunday evening symposium on the training of food technologists.

With Dr. E. M. Mrak as chairman, the symposium served to spotlight the divergent concepts of what constitutes a food technologist. One prominent speaker ignored factories entirely when he referred to those present as coming from offices, laboratories and classrooms. Those who teach the subject indicated a trend toward a five-year course of instruction.

In reporting on "What Determines Quality in Food," at the first general session, Dr. F. W. Fabian, Michigan State College, indicated that the most important factors were genetic composition, soils, maturity of crops, harvesting, microorganisms and enzymes, sanitation, processing, storage, and quality losses in consumer cooking. He emphasized sanitation and pointed to a fundamental change in the use of water in food plants. Formerly a great deal of water was used in cleaning, but now the idea is to use less but to use it more intelligently.

Food attributes that are capable of objective quality measurement, according to H. R. Smith, National Canners Association, are size designations, viscosity, thickness, hardness, resistance to crushing, firmness, consistency, turbidity, color, maturity of vegetables, ripeness of fruit, and succulence. The volume of juice expressed from a unit weight of food raw material is an index of its succulence and has led to the development of an objective measuring device known as the Succulometer. Flavor, on the other hand, is a physiological sensation and cannot be used as an objective test.

A plea for fundamental research that will aid understanding of what changes make food unfit to eat was voiced by H. P. Lundgren, Western Regional Research Laboratory, who outlined a theory of molecular interaction in foods and its possible applications in food technology.

Staphylococcus poisoning is still a very important problem in the food industry, declared Dr. G. M. Dack, University of Chicago, in his talk on "Bacteriological Aspects in Food Handling and Processing." Of late, he said, it has been showing up in ham, where lack of refrigeration and improper handling is a common cause of development of the toxic material. A simple test is urgently

---

**The officers chosen to head IFT during the coming year were: Dr. E. H. Harvey, Sun Chemical Co., New York, president; H. C. Diehl, Refrigeration Research Foundation, Berkeley, Calif., vice-president; Dr. George J. Hucker, New York State Agricultural Experiment Station, Geneva, N. Y., reelected secretary. New Councillors-at-large are: Dr. F. C. Blanck, H. J. Heinz Co.; Dr. L. V. Burton, FOOD INDUSTRIES, New York; John T. Knowles, Libby, McNeill & Libby, Blue Island, Ill.; Dr. R. C. Newton, Swift & Co., Chicago; Dr. S. C. Prescott, Massachusetts Institute of Technology, Cambridge, Mass.**

Lt. Col. G. V. Hallman and former Major M. A. Joslyn swap yarns on their experience in Australia as U. S. Army food technologists.

needed for pathological strains of staphylococci.

Dr. A. K. Balls, Western Regional Research Laboratory, gave a thought provoking and comprehensive discussion of enzyme control. He pointed out that enzymic reactions, in living raw material, are frequently a series of consecutive reactions. Because all the different enzymes have different temperature coefficients, it is possible to have a most unfavorable storage temperature at which intermediates will accumulate. There is a theory, he said, that accumulation of a very high reducing substance is necessary to account for the high respiratory quotient and evolution of carbon dioxide. He cited lemons as a case in point, suggesting that the peel of the lemon is the source of most of the carbon dioxide evolved and that variations between observations in different laboratories are probably due to variations in damage to the skin. His own experiments showed that these surface injuries could increase carbon dioxide by as much as 465 percent. He showed, too, that an insufficient blanch of a vegetable may be less effective in stopping enzyme activity than no blanch at all. His report that the sweet potato is the world's richest source of beta amylase may prove important later on.

At the Monday afternoon session on food plant operations, Dr. J. M. Jackson, American Can Co., Research Division, outlined and illustrated a method of treating tomato juice and tomato juice cocktail to destroy thermoduric microorganisms without harming the flavor and color of the canned juices. The method involves preheating at 250-270 deg. F., filling and closing cans at about 200 deg. F., and holding the sealed can for about 1 minute before cooling for casing and storing. If the closing temperature is 190 deg. F., the cans are inverted and held on the runway for 3 minutes before being fully cooled for casing and storage. A closing temperature of 200 deg. F. requires only 1 minute inverting and holding time for the cans. Cans sealed at lower than 190 deg. F. should be given a hot-water treatment before cooling. Either the tubular or the plate type heat exchanger may be used.

J. I. Thompson, J. I. Thompson Co., defining "line operations" for food processing, indicated that the definition might be "narrow" when applied to continuous operations and "broad" when applied to discontinuous or batch operations. He did not favor continuous operation when the volume of production is low and

Dr. E. H. Harvey, director of research, Sun Chemical Co., accepts the presidency of IFT and expresses his thanks to members.

when the operation is intermittent. Continuous operations do permit the establishment of uniformity in quality if they are properly controlled, particularly when carried out under automatic control instrumentation.

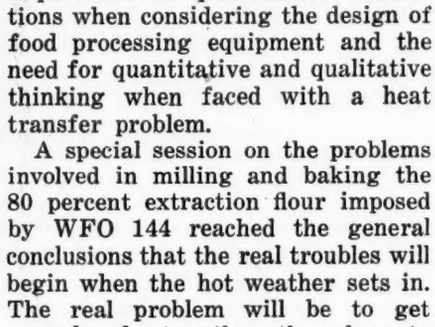
W. L. Campbell, Massachusetts Institute of Technology, emphasized the importance of cost determinations in the processing of foods. He stated that many small concerns do not know their costs and blame their financial failures on other factors. Also he warned that there are fads in cost figures and that unless they carry a meaning to those for whom they are intended, the figures are worse than useless. Three factors in production costs were identified to be: (1) labor costs, whether direct or indirect; (2) materials costs, which should be carried in accurate receiving records; and (3) overhead costs, which should be broken down and identified with departments using them.

Wm. Geisler, Pepsi-Cola, New York Bottling Co., presented an analysis of the direct relationship between materials handling and the cost and effectiveness of manufacturing operations. Materials handling was divided into bulk handling and finished product handling. Both phases were discussed in relation to the installation of conveyors and other mechanical means for handling raw materials and for the handling of the finished product in relation to its packaging, storage, and distribution. He recommended the establishment of a sound, practical formula to determine the beneficial value of automatic handling equipment. Too often, he said, sufficient consideration is not given to the net result of such installations.

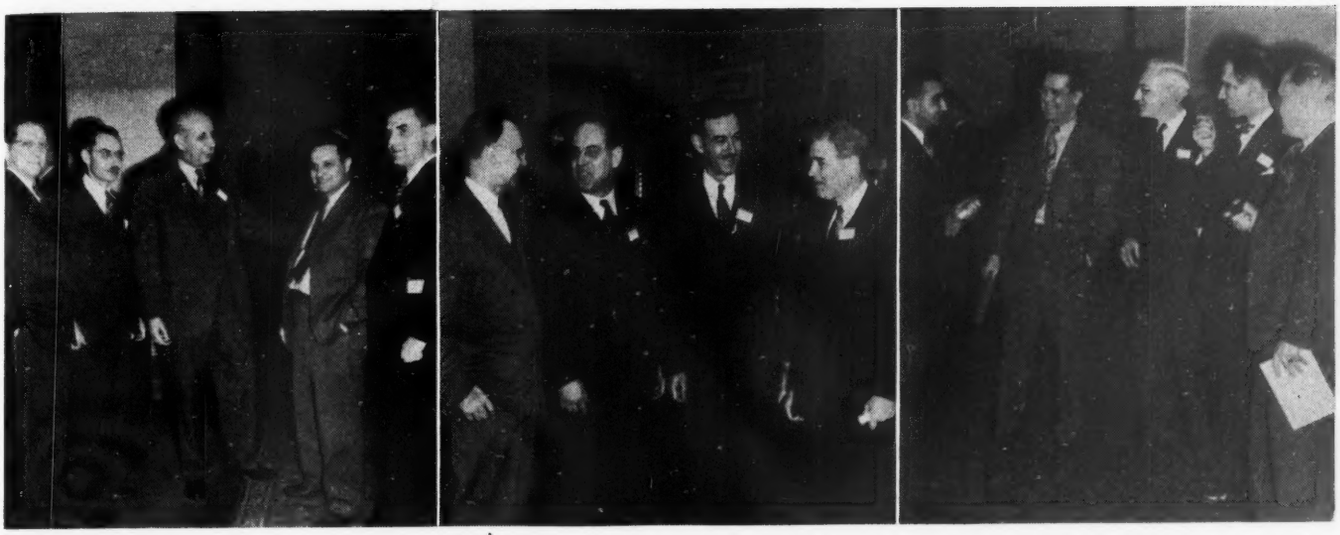
James Donovan, Artisan Metal Products Co., discussed various methods of heat transfer with particular emphasis on the role of conduction and convection of heat when handling fluids. He emphasized the importance of quantitative calculations when considering the design of food processing equipment and the need for quantitative and qualitative thinking when faced with a heat transfer problem.

A special session on the problems involved in milling and baking the 80 percent extraction flour imposed by WFO 144 reached the general conclusions that the real troubles will begin when the hot weather sets in. The real problem will be to get enough wheat rather than how to handle it.

At the session devoted to sanitation, Dr. A. C. Hunter, Food and Drug Administration, described the



On the right Gordon H. Maybee, Fry-Cadbury, Ltd., and Earl D. Stewart, Schwarz Laboratories, Inc.

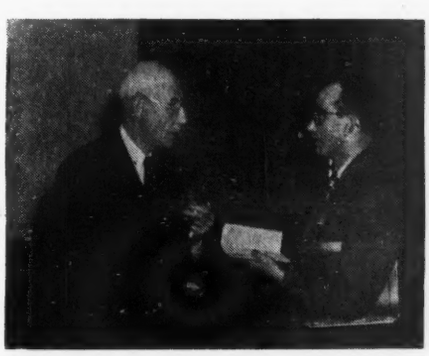


Left: James Dahl, James Dahl Associates, Syracuse, N. Y.; B. M. Shinn, Armour & Co.; R. V. Wilson, Continental Can Co.; Dr. L. V. Taylor, Research Division, American Can Co.; M. E. Parker, food production counselor, Chicago. Center: Dr. Aksell Olson, director of research, General Foods Corp., Hoboken, N. J.; John H. Nair, assistant director of research, Continental Foods, Hoboken, N. J.; Dr. J. Maveety, chief chemist, National Biscuit Co., New York; W. L. Campbell, professor of food technology, M.I.T. Right: A group of food technologists enjoy a gab fest, after the two-year lapse caused by the cancellation of last year's conference.

agency's view on sanitation, as that maintenance that excludes obnoxious and repulsive conditions or materials. Under this concept of adequate sanitation, not only rats and mice are offenders, but also insects, repulsive residues and uncleanliness, polluted water, deplorable toilets—though far from foods, they are close in disease communication—inadequate inspection of raw materials, infested or rotten raw stocks that are permitted to enter the plant, misbehaviour of personnel, improper waste disposal and inadequate washing and cleaning facilities. Dr. Hunter pointed to the microanalyst as an important factor in the government's detection of insanitary conditions. He referred those interested to F&DA's Circular No. 1, which summarizes the sixth edition of "Methods of Analysis of the Association of Official Agricultural Chemists," and can be purchased for 30 cents from the Superintendent of Documents, Washington 25, D. C.

Dr. George J. Hucker, secretary of IFT, reported that quaternary ammonium compounds, or cationics, have special advantages and special weaknesses when used as germicides in food plants. He said that hot water, steam and chlorine are also good.

Out of 1,500 rodent control agents investigated, D. A. Spencer, Denver Wild Life Research Laboratory, reported three that were found to be very good, while six showed promise. Imported red squill can be used safely by the public, he said, but it needs correct technics in its use to insure satisfaction. Another rodenticide, "1080," proved so highly toxic that a rat killed by it will also kill a good sized dog if the dog should consume the rat. Action is extremely rapid with 1080, killing in about an hour. It also forces the rat into the open, although it is not yet known why. In one test 1,300 dead rats were found on a dump. Thallium requires from six to seven hours to kill. It is a cellular poison, whereas "1080" is a nerve poison. The former "Antu" was also mentioned as a rodenticide that has the effect of drowning its victim in his own liquid, since it causes edema of the thoracic cavity. The bait to use for rats should strike a judicious balance between the food in the plant, to which the rat might have access, and the bait that is to attract the rat. The bait should be a fine mash or a liquid. For mice he prefers to use cereal bait with a sweet spreader, he said, adding that mice are more difficult than rats to control.

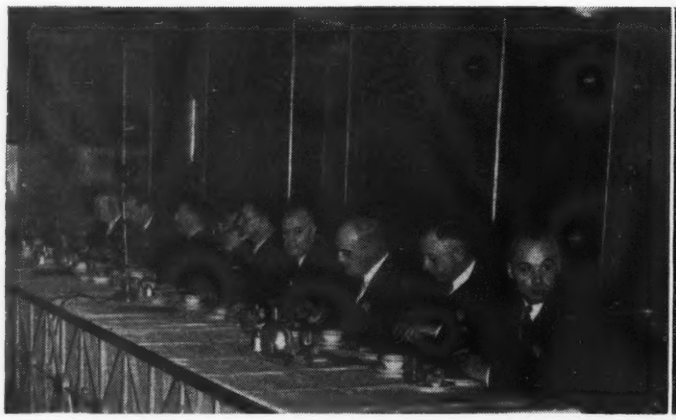


Dr. A. K. Balls, Western Regional Laboratory, answers question following his talk on enzyme control in food processing.

It is more important to keep idle equipment free of food residues than to keep it dust-free, in the opinion of Dr. C. R. Stumbo, Owens-Illinois Glass Co., who emphasized the importance of carrying on all the necessary cleaning operations during the lag phase. He urged periodic cleaning during the day to avoid the transfer of bacteria during their phase of rapid growth. By suitable cooling the lag phase can be doubled. On the other hand, he pointed out that free water on products or equipment should get special attention, as its presence will often hasten the period of rapid bacterial growth. There is an urgent need, he thought, for research to find a mathematical formula by which bacterial growth in foods can be predicted, so that it would be possible to know the practical limits of time, temperature, relative humidity, and the like, in food processes.

Dr. N. H. Sanborn, National Canners Association, proposed central waste disposal plants, such as the use of a central alfalfa drier for fruit and vegetable waste as a remedy to the waste disposal problem. The extent of this waste amounts to 25 percent from beets, carrots and tomatoes, 35 percent from apples, 75 percent from pears, and 86 percent from corn. He recommended the lagoon method for liquid waste disposal, in which the liquid is dosed with nitrate to prevent its becoming a nuisance.

Three aspects of sanitation engi-



**Left: The speakers' table at the Atom Bomb luncheon shows Carl S. Pederson, looking this way, R. C. Newton, F. C. Blanck, G. J. Hucker, B. E. Proctor, J. H. Teeter, F. W. Tanner, K. G. Dykstra and S. C. Prescott. Right: Oswald Freund, Red Star Yeast & Products Co., standing alongside the man with the pipe; Ted Carl, R. C. Williams Co., is on the extreme right and next to him in the foreground is John C. Lankenau; Harry C. Goresline, USDA, is taking in the whole scene from a vantage point in the center rear.**

neering—which is not to be confused with sanitary engineering—were discussed by M. E. Parker, Chicago consultant, who confined his talk to pest and vermin control, surface cleanliness, and asepsis, or aseptic control. He recommends the one story-type plant with a floor sloped 3/16 in. per foot and hard surfaced, adequate floor drains and glazed tile walls. Proper placing of equipment, rodent proofing, and proper screening all contribute to sanitation. He urged caution in the use of insecticides and recommended consulting entomologists before embarking on a wholly new program. By way of emphasizing the importance of sanitation, he recalled a recent Supreme Court decision which placed responsibility on a corporate executive when actual or potential adulteration exists, whether or not that executive knows of its existence.

A departure from the programs of previous conferences was the Tuesday afternoon session on dairy technology. The interest in powdered whole milk was indicated by the overcrowded attendance to hear S. T. Coulter, University of Minnesota. He summarized the newer knowledge involved in the manufacture of powdered whole milk under the following eight points: 1. While fresh high quality fluid milk is desirable, good milk powder can be made from any reasonably good fluid milk under selective processing. 2. Avoidance of contamination by copper is essential, particularly with air-packed powder. 3. Present trend in the making of powered whole milk is to use flash preheating to as high as 230-240 deg. F., particularly when the fluid milk used is less than highest quality and when the powder is to be air-packed. 4. Keeping quality of powdered milk is not improved by mechanical clarification. Even centrifuging and separate drying of the skim milk and cream, with subsequent blending, have not shown sufficient improvement in powder quality to justify commercial use. 5. Moisture content of more than 2.5 percent for the powder accelerate the development of a stale or "off" flavor. Oxidation of the milk fat is a problem when powder of extreme low moisture content is air-packed.

### Shows Progress

Progress has been made in retarding this oxidative deterioration by gas packing, as well as by drying in an atmosphere of nitrogen or $CO_2$. Whole milk dried in nitrogen, or $CO_2$, when tested afted 18 months was as good as it was after 3 months under same storage conditions. 6. Prompt cooling of the powder is desirable when the drying, cooling and packaging are carried out under normal commercial conditions. The time lag between drying and cooling is not significant. 7. Flavor deterioration during storage is most effectively retarded when oxygen content of package is kept to not more than 0.01 cc. per gram of powder. Occlusion of air in the powder particles necessitates special methods of gas-packing to obtain and maintain this oxygen level. 8. Antioxidants aid in prolonging the shelf-life of air-packed powder, but have no value in gas-packed powder.

G. H. Wilster, University of Illinois, reported an improvement of 3 to 4 points in score of butter made from "off-flavored" or "off-odor" cream when direct contact steam pasteurization under vacuum is used. The treatment is effective with such flavors and odors as onion and scale. Direct contact steam pasteurization is obtained by diffusing the steam, at the desired temperature, into direct contact with the milk or cream in an atomized state in such a way that objectionable or undesired odors and flavors are removed by steam distillation. Claim is made that the dissolved oxygen is dissociated and has a complementary processing effect. Temperatures of the pasteurizing steam vary according to whether the cream or milk is to be used for making butter, cheese or ice cream; 200 deg. F. for butter or ice cream mix, and 165-175 deg. F. for cheese. Time of treatment for the entire flow cycle is 8 to 12 seconds, of which only 1 to 2 seconds is at 200 deg. F. In addition to improving the odor and flavor of milk and cream, the treatment is said to prolong the storage life and keeping quality of butter and ice cream, improve the body and texture of the butter, and speed up the aging or ripening of blue-veined and non-blue-mold types of cheeses made from the treated cream and milk. The treatment, may also be used in making condensed milk.

Harold G. Dunlap, H. P. Hood & Sons, gave a movie-illustrated report on how the Hood company has applied work simplification technics to its plant operations. As director of the company program, he had two objectives: To prove the value of the flow process chart, and to train the supervisory personnel to realize the need for methods study and to become motion minded. Illustrations showed a marked decrease in waste motions to do simple tasks, an increase in production with the same labor, but with less fatigue, and, finally, increased production with less labor and also with less fatigue per worker.

C. W. Anderson, Rockford Health Department, reviewed a milk control

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# Immersion Freezing In Liquid Nitrous Oxide

By GORDON MACKINNEY,* Division of Food Technology
University of California, Berkeley, Calif.

**Quick freezing by immersion in a nontoxic liquid that will evaporate, leaving no trace, is the food technologist's ideal. Refrigerant is recovered and used again in German "pilot" operation, capable of handling a ton of food an hour**

AT the plant of I. G. Farbenindustrie at Höchst near Frankfurt, Germany, a method has been developed for quick freezing of foods, by immersing them in liquid nitrous oxide at –90 deg. C. under a pressure of only one atmosphere. Nitrous oxide is manufactured from ammonium nitrate and stored in cylinders under pressure. Its prewar use was almost exclusively confined to pharmaceutical use, particularly anaesthesia. For a time during the war, it was also used for the quick starting of airplanes, the ratio of oxygen to nitrogen being more favorable than in air.

Use of $N_2O$ as a refrigerant was developed by the German desire to find additional outlets for the product. Although they solved the engineering problems involved in nitrous oxide food freezing, they regarded this development as little more than a pilot scale operation. Even so, they developed a unit with a capacity of 900 kg. (about one ton) per hour, which is a substantial commercial rate of freezing. Manufacturing cost of the compressed nitrous oxide in cylinders was estimated to be 60 pfennigs per kg. and the sale price was to have been set at one Reichsmark (prewar 40 cents), had their plans matured. It should be understood that I. G. Farbenindustrie constructed the unit primarily to demonstrate its feasibility. The food preparation plant was a considerable distance away, in a different building, from the cold storage rooms, and commercial production was not contemplated here.

It should be emphasized that immersion freezing in a liquid, such as nitrous oxide, has certain theoretical advantages over current methods, and therefore deserves thorough study by producers of frozen foods. The food to be frozen is immersed directly in the liquid nitrous oxide.

*Investigator in Germany for Technical Industrial Intelligence Committee.

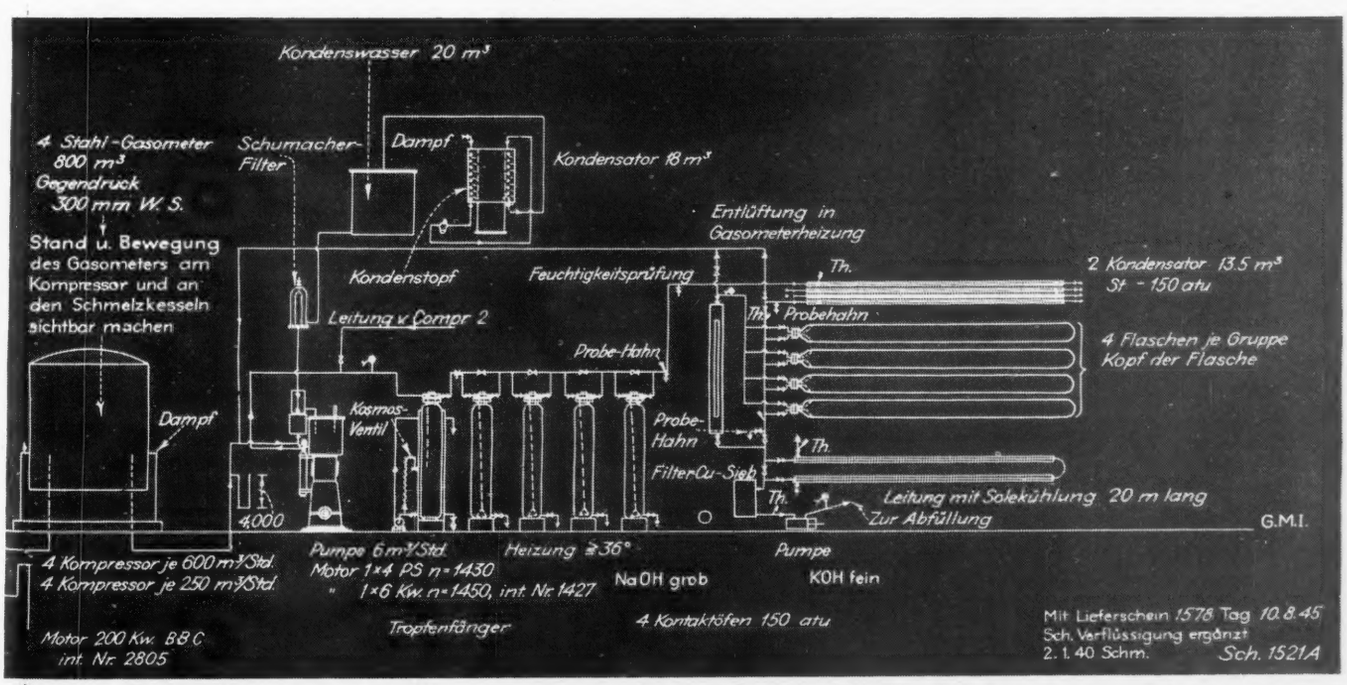


**FIG. 1. System of compressing, liquefying and storing nitrous oxide under pressure. (Stahl-Gasometer, etc.= steel gasometer, 800 cu. capacity, back pressure 300 mm. of water. Kondenswasser, etc. = condenser cooling water, 20 cu.m. per hour. 2 Kondensator, etc. = 2 condensers, 13.5 cu.m. per hour at 150 atmosphere pressure. 4 Kompressor, etc. = 4 compressors, each with capacity of 600 cu.m. per hour; and 4 with 250 cu.m. capacity. Leitung mit, etc. = pipe, brine cooled, 20 m. long to draw off.)**

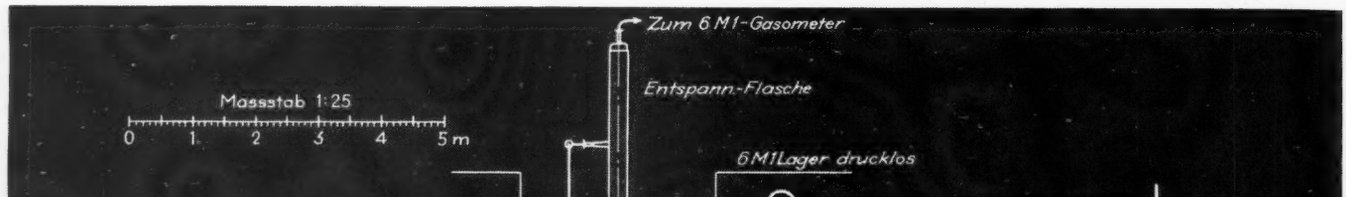


**FIG. 2. Flow diagram of liquid nitrous oxide. (Massstab = scale. Entspann.-Flasche = expansion tank. Lager drucklos = pressureless storage. Kühler = cooler. Gitterrostabdeckecung = floor grating. Betonbühne = concrete platform or floor.**

This is unusual because the nitrous oxide is, in a sense, the primary refrigerant, and advantage is taken of both the sensible and latent heats. In these respects it differs from precooled brine, sirup or glycerine refrigerants. From the standpoint of heat transfer, the product is surrounded by a liquid and is more efficiently cooled than if a cold blast gas or air system is used. For convenience, vegetables are packed in paper cartons prior to immersion, but fruits generally are not wrapped. There appears to be no harmful or residual effect on the food as a result of this practice. A general outline of the process and the different cycle is presented, followed by details, to avoid confusion.

### The Nitrous Oxide Cycle

Nitrous oxide gas at outside ambient temperature (0 deg. to 20 deg. C.), at a pressure of slightly over one atmosphere in a gasometer (see Fig. 2), is compressed to 80 to 90 atmospheres, water-cooled, liquefied, then cooled by ammonia in two stages to –55 deg. C., next passed through an expansion valve to a chamber and thus brought to one atmosphere. It is thereby further cooled to –90 deg. C. From here it is drawn off to a storage tank. Wherever gas is formed, it is piped back to the gasometer to retain the nitrous oxide in the system. In the latter case, it also provides a means of keeping the liquid at –90 deg. C. by slow evaporation at a cost of about one-half percent per day.

From the liquid storage tank it is withdrawn to a cylinder fitted with a piston. It is then forced into one of three vessels containing the food to be frozen. As the nitrous oxide evaporates, it is returned to the gasometer, completing the $N_2O$ cycle.

### The Food Cycle

Three units are required. (See Fig. 3.) While No. 1 contains food being frozen, No. 2 contains food being precooled, and No. 3 is being unloaded and recharged. Unit No. 2 is then frozen, No. 3 is precooled, and No. 1 is unloaded and recharged. Since 20 minutes is allowed for freezing, the use of three units permits continuous batch production, each being frozen in succession.

Gaseous nitrous oxide arising from evaporation in a given vessel is returned to the gasometer via the unit being precooled, thus permitting more efficient utilization of the cold gas being returned to the outside temperature of the gasometer.

### Operational Details

In studying the detailed description of the operation, it is advantageous to refer to the three drawings accompanying this report.

Fig. 1 shows the compression, liquefaction and storage of nitrous oxide under pressure.

Fig. 2 shows the cooling system, reducing liquid nitrous oxide to one atmosphere at –90 deg. C.

Fig. 3 describes the food freezing cycle.

### Details of the Nitrous Oxide System

The $N_2O$ gas in the gasometer is at a pressure slightly in excess of one atmosphere, equivalent to about 30 cm. of a water column. The gasometer has a water seal, hence the gas is moist.

**Compression**—Compression is in three stages, to 7, then to 25 and finally to 80 to 90 kg. per sq. cm. These metric pressures correspond roughly to the same number of atmospheres. (7 kg. per sq. cm. =106 psi.; 25 kg. per sq. cm. = 381 psi.; 90 kg. per sq. cm. = 1368 psi.) The compressor with a rated capacity of 360 cu. m. per hour is made by G. A. Schulz, and is driven by 100 kw. motors, 3,000 volts, drawing 28.6 amperes at the rated load.

**Removal of Moisture**—The compressed gas at 80 to 90 atmospheres (the fluctuation depends on the outside temperature) is scrubbed in tall columns containing coarse NaOH, then finer KOH, to remove all traces of moisture. (See Fig. 1.)

**Cooling**—The gaseous nitrous oxide is then liquefied in a water condenser at 30 deg. C. and stored in large cylinders about 45 ft. long. It can be drawn off from this point

for shipment as liquid nitrous oxide under pressure.

**Reduction to One Atmosphere**—The liquid $N_2O$ is then passed through two ammonia cooling units (see Fig. 2). In the first, the ammonia is at one atmosphere pressure and therefore at about –28 deg. C. The $N_2O$ is cooled to about –25 deg. C. In the second, the ammonia is under vacuum, at –60 deg. C., and therefore at about one-third of an atmosphere pressure. Here the $N_2O$ is further cooled to –50 to –55 deg. C. A Linde compressor operates in the ammonia system. The liquid $N_2O$ next passes through an expansion U, thence through a valve to a chamber, where it is reduced to one atmosphere, and is thereby cooled to –90 deg. C. Two phases are thus formed, the gaseous nitrous oxide, together with admixed air contaminants, which are returned to the gasometer, and the liquid, which is drawn off to the heavily insulated storage tank. Air that may be present as a contaminant is unimportant since it is automatically by-passed back to the gasometer. Moisture and carbon dioxide have been eliminated by the earlier treatment with the caustic alkali. For the insulation of the tank, natural cork was preferred, but "Iporka," a synthetic substitute, had to be used. A small leak or bleed back to the gasometer keeps the liquid at one atmosphere, and consequently at –90 deg. C.

### The Food Freezing Cycle

(Preparation and storage of the food are reported separately.) Vegetables are placed in special paper cartons, which are later dipped in Oppanol, a plastic for moisture-proofing, about 50x30x10 cm. The carton is slipped into a perforated iron container fitted with a handle and 14 such containers are stacked into the freezing unit. The net weight of food in the batch varies from 280 to 300 kg. For the three units, the capacity is thus about 900 kg. per hour. The freezing units are constructed of copper, this metal being the most suitable at low temperatures, are cylindrical in shape, about 1.2 m. in diameter, with a volume of 2.5 cu. m. Each unit is heavily insulated with Iporka. Two have gaskets and lids that are clamped down in a conventional manner. The third has a double water seal, in place of the gasket. This was an attempt to simplify handling. In this case, the residual $N_2O$ cannot be recovered, as the vessel cannot be evacuated prior to unloading. It may be noted that, while the plant officials did not regard the loss as appreciable, it entails the loss of possibly 1 to 1.5 cu. m. per batch. A small heating coil is inserted in the inner water seal, to prevent the water from freezing. Either method of closure of the freezing units is considered satisfactory, and losses of $N_2O$ to the atmosphere are small.

Food is frozen for 20 minutes and the $N_2O$ evaporated is led back to the gasometer via the adjacent unit which is thereby precooled. During the 20-minute immersion, the center of the package reaches a temperature of –38 deg. C. As will be seen from Fig. 3, the remaining unit, under the heading "Vorbereiten" is being unloaded and reloaded. The vessel is shown attached to a "Gebläse"—resembling a Roots blower, and a "Vakuum-pumpe." These are for the purpose of removing residual $N_2O$ so that the minimum amount is lost from the circulating $N_2O$ system when the lid is removed for unloading. The loss sustained by I. G. Farbenindustrie, pulling a vacuum of approximately half an atmosphere, appears to amount to possibly half a cu. m. While they regard this as negligible, it is certainly capable of improvement.

### Preparation of Foods Prior to Freezing

A detailed criticism of the food produced at this plant is out of place here and is irrelevant, except insofar as the method of freezing may have

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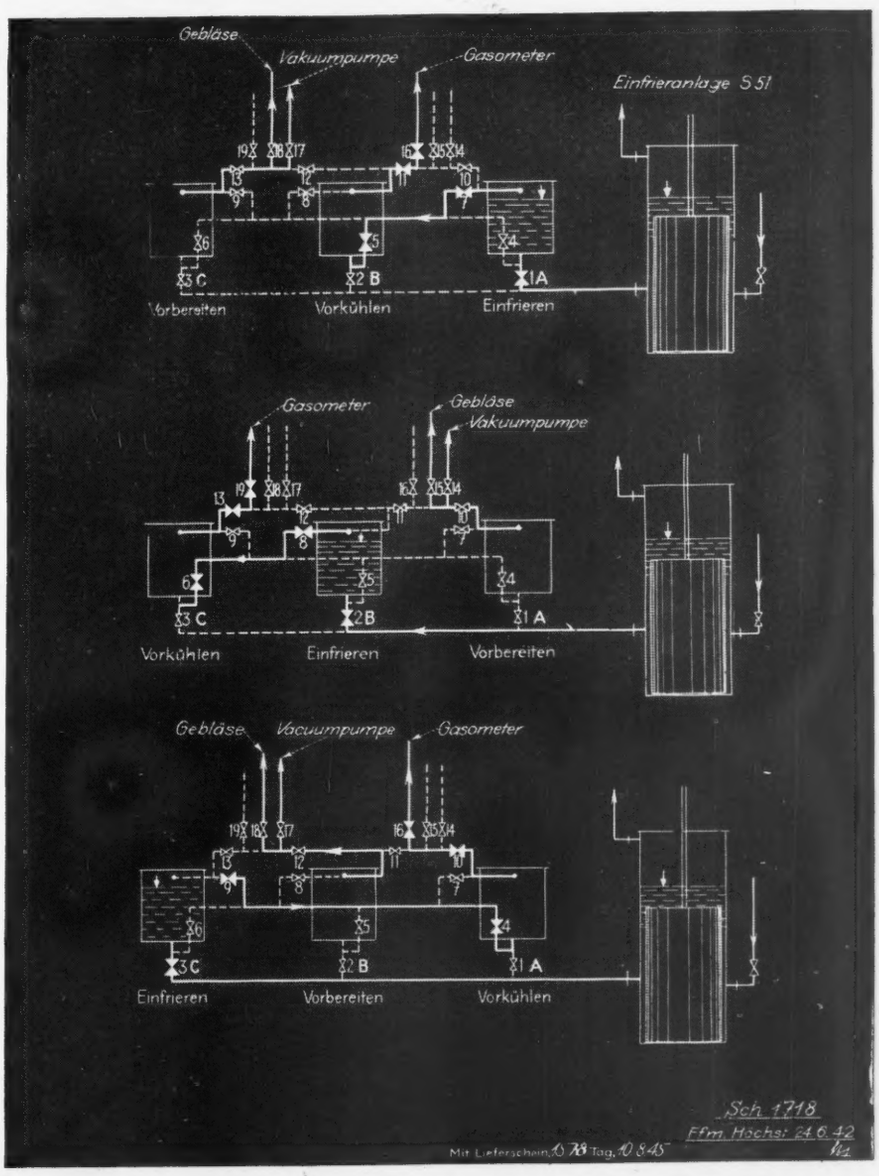
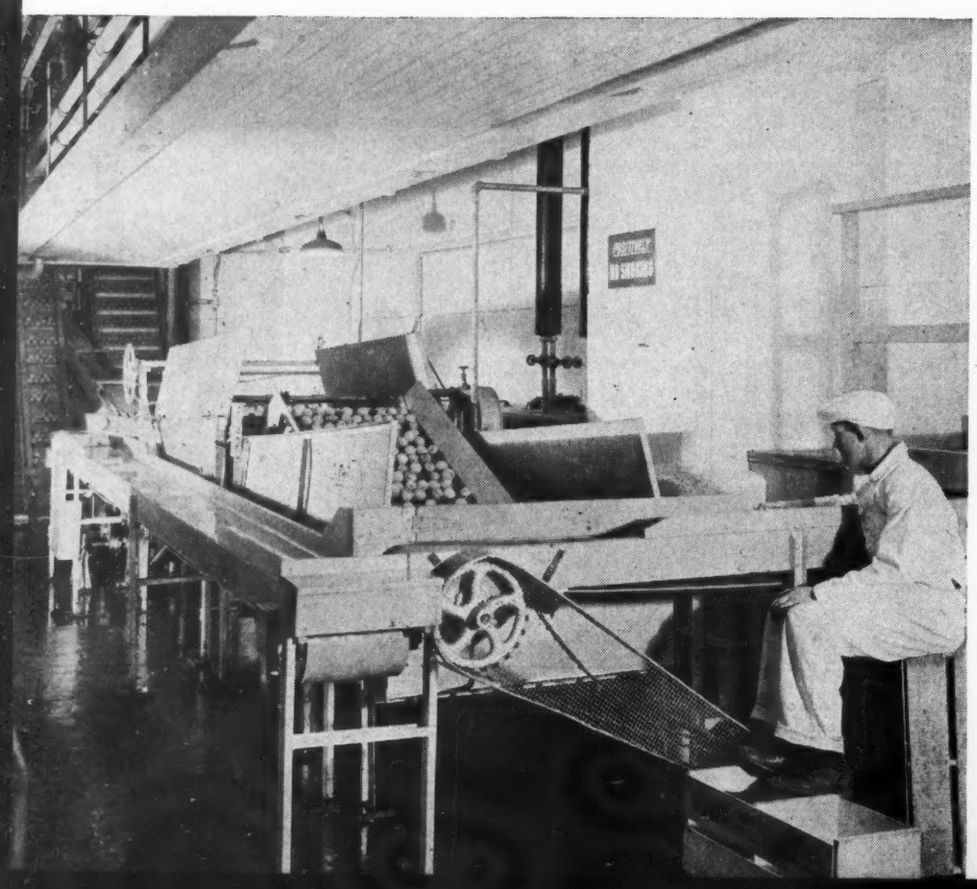



**FIG. 3. Operating scheme. Free translations: Vorbereiten = preparation loading, Vorkühlen = precooling, Einfrieren = freezing, Gebläse = blow off, Einfrieranlage = freezer storage.**

1. Fruit from the various groves is blended and carefully inspected before it is carried into the processing rooms by elevator at right.

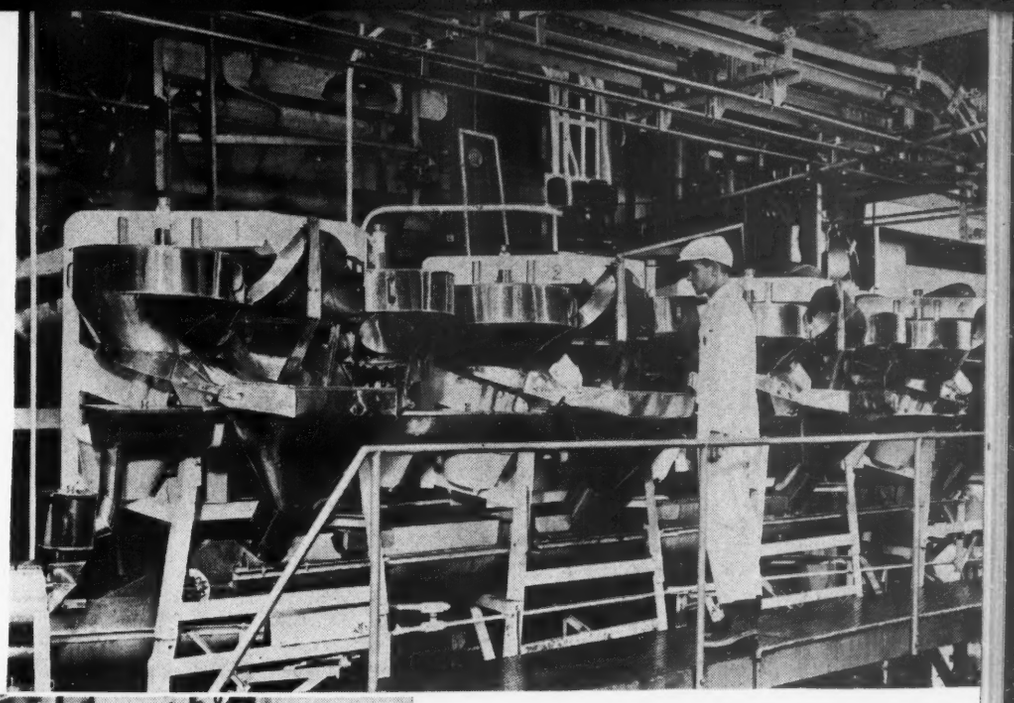
# FROZEN ORANGE JUICE

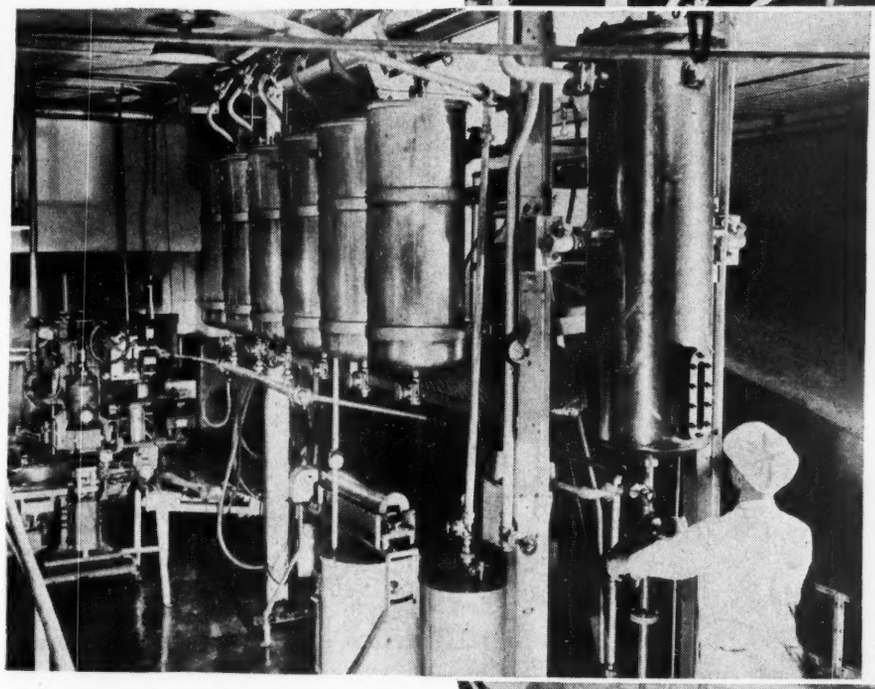
**It takes the California Consumers Corp. about 40 minutes to quick freeze orange juice. This picture story of the process was made at the corporation's plant in the heart of the western citrus belt**



2. Conveyor belts carry the blended fruit to the first processing operation, that of washing in cold water, then a thorough scrubbing by large revolving brushes under ice water showers. From here the fruit is conveyed to graders (not shown) where it is sized for the different sized extractors. Thus the halves can be held firmly during reaming operations, preventing the introduction of the bitter elements from the rind and peel.

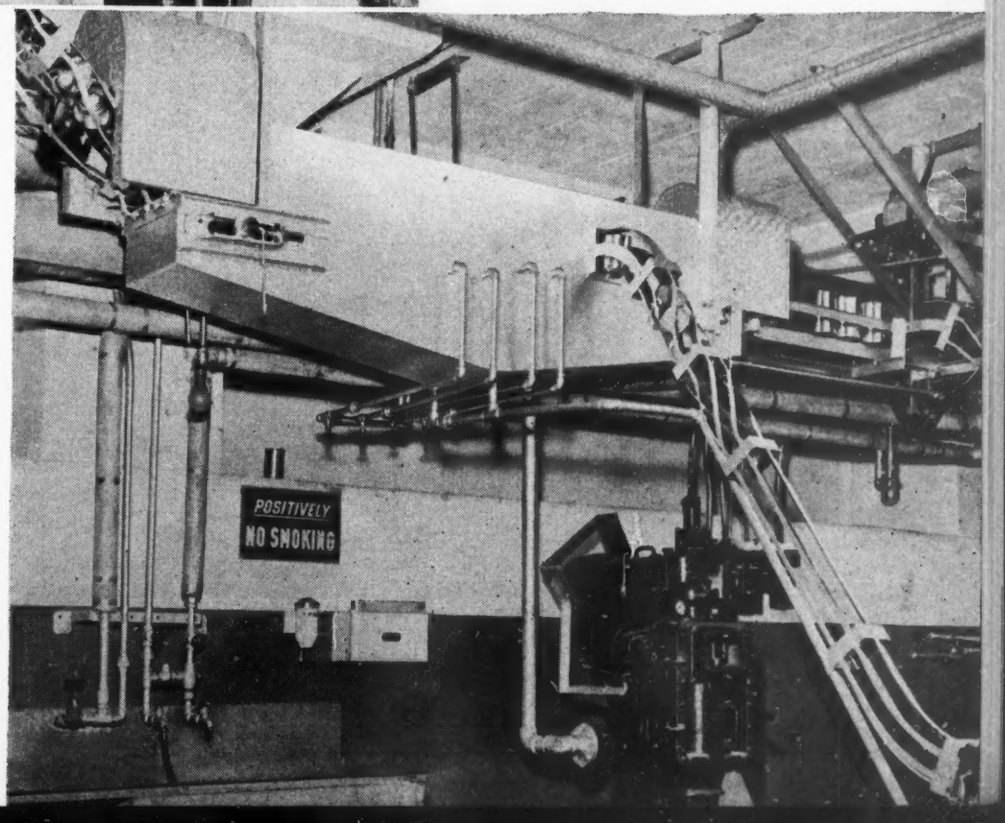
3. Carried from the graders to these specially designed, fully automatic, stainless steel juice extractors, the fruit is fed across a cutter knife. The halves are then grasped by pure gum rubber cups, which are synchronized with burrs that ream out the juice. The juice then passes through a slowly revolving stainless steel strainer with the proper screen size to control the pulp content. The empty cans on their way to the can sterilizer may be seen on the conveyor immediately below the ceiling.

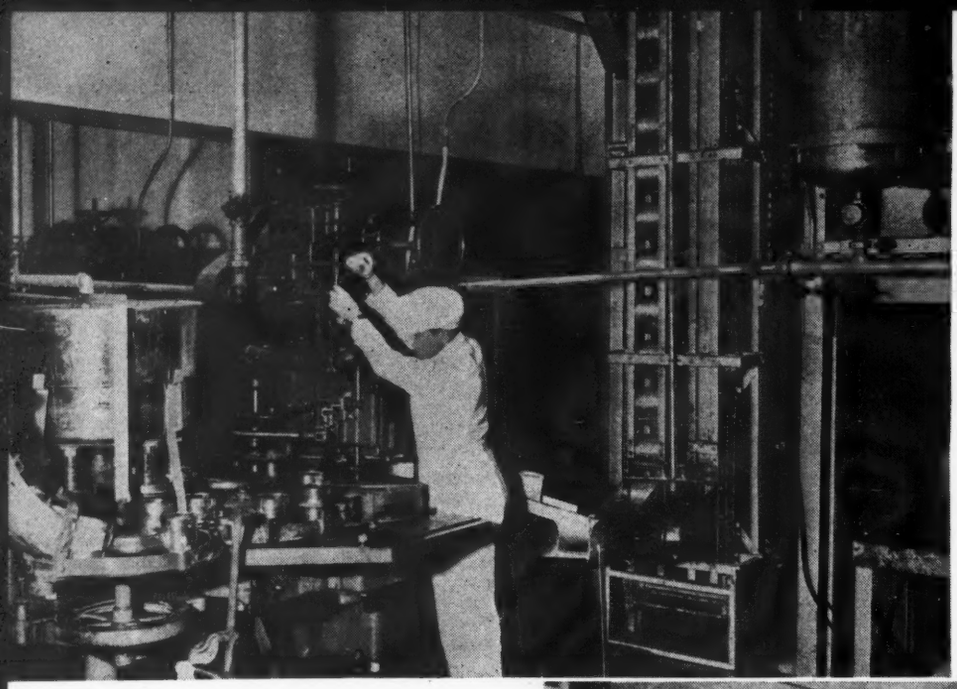




4. Stainless steel pipes carry the juice to the cooling unit, where the temperature, which rises slightly during extraction, is lowered again. Following inspection, the juice is delivered into a stainless steel evacuator where it passes over a series of stainless steel plates while under very high vacuum. This vital step eliminates oxygen, thus preventing development of off-flavor and minimizing loss of vitamin C. Removal of air from the pulp cells reduces their tendency to separate after the juice has been removed from the can. The juice is delivered to the evacuator in about 80 seconds after the fruit reaches the reamer. The deaerated juice, at approximately 33 deg. F., is carried from the evacuator to a refrigerated receiver from which it is delivered to the can filler.

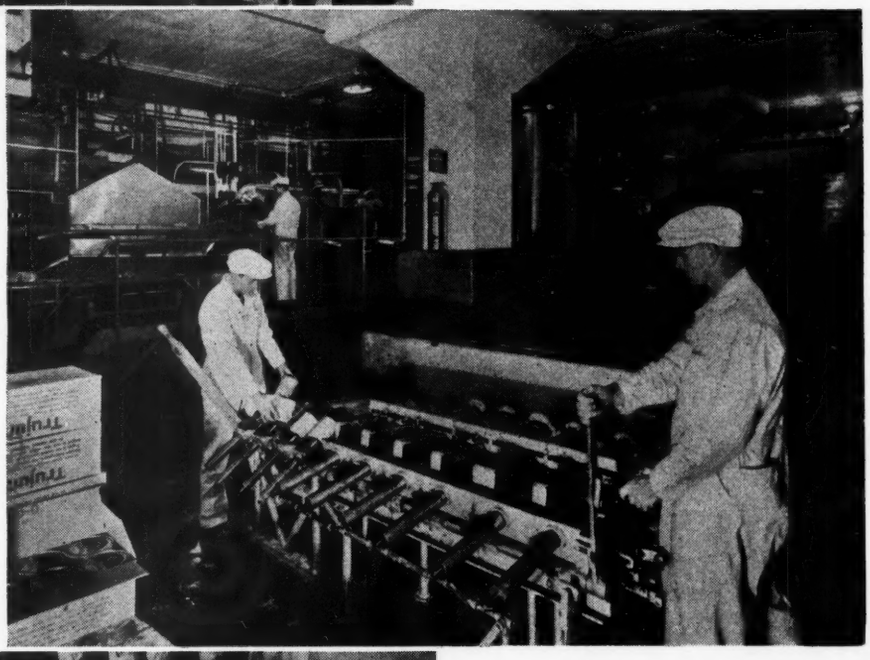
5. In the meantime, baked enamel-lined cans are being delivered to the steam sterilizing chamber at the upper left. They then travel down the chute, on the right, to the can filling machine. The small machine at the bottom of the picture is a vacuum closing machine for sample cans.

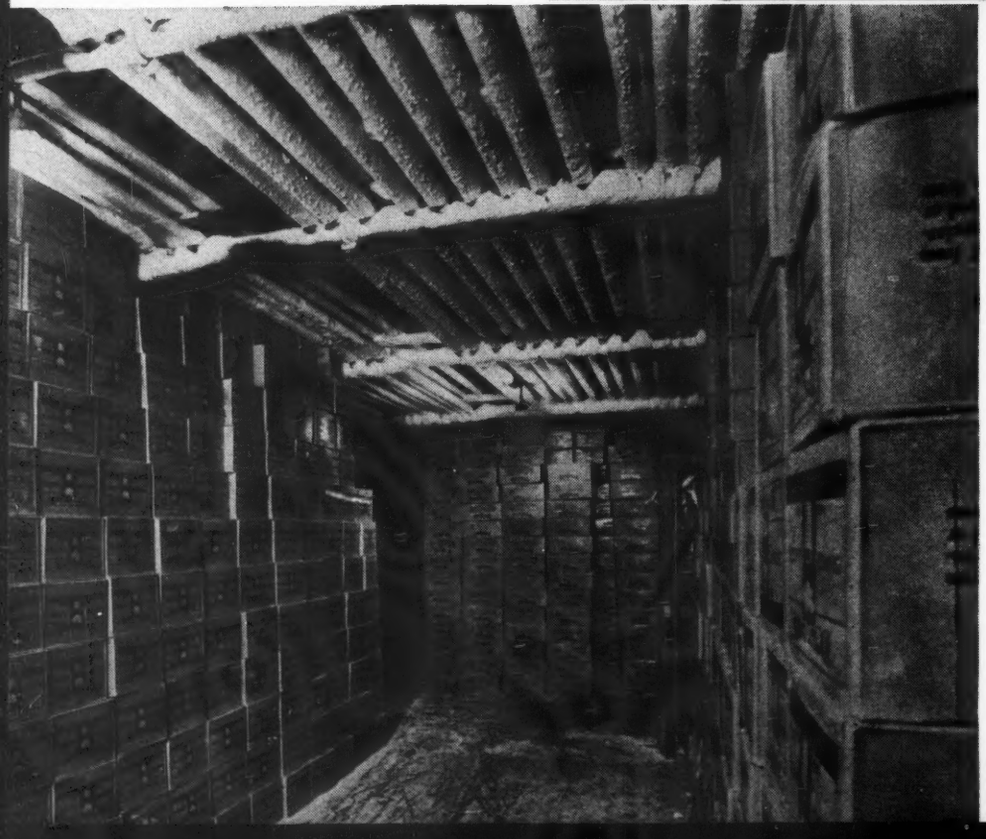




6. The cans are automatically filled, on the left, leaving space for expansion during freezing. The can closing operation, right, is carried out under vacuum. The chain driven elevator, at the far right, conveys the filled and sealed cans to the freezing tubes.

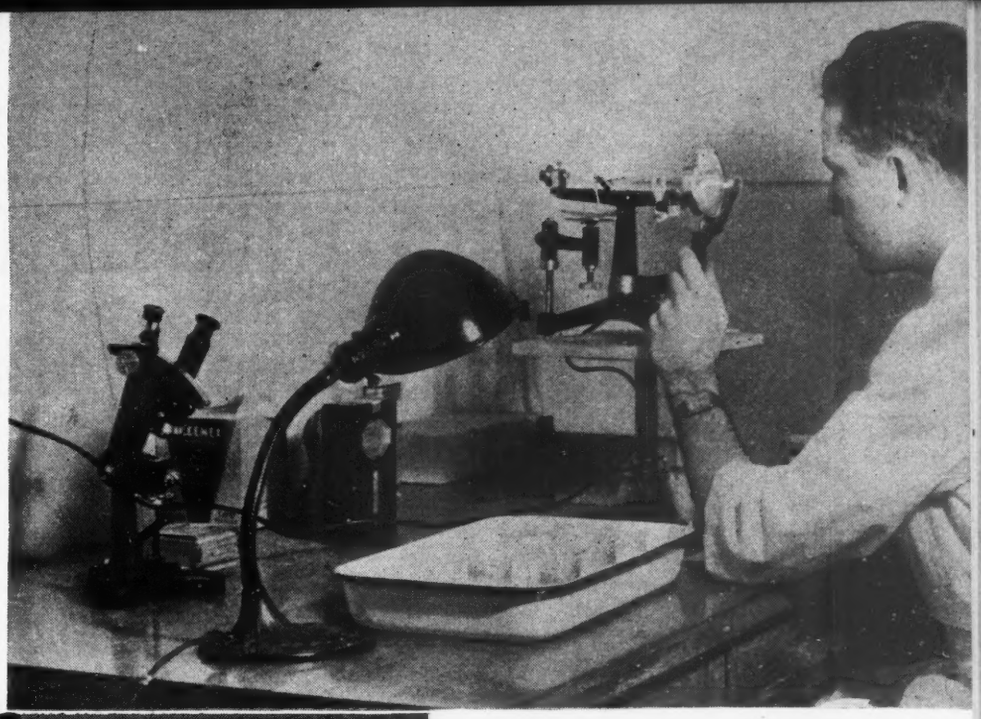
7 An attendant (not shown) takes the cans from the elevator and places them into the freezing tubes. As they progress downward in the thoroughly insulated tubes, the filled cans are subjected to a bath of alcohol brine at approximately 35 deg. F. Agitation during freezing eliminates the possibility of separation. The harvesting equipment, shown in the foreground, is used to remove the cans of frozen juice from the tubes. The cans are here placed in cases and delivered to the storage rooms.

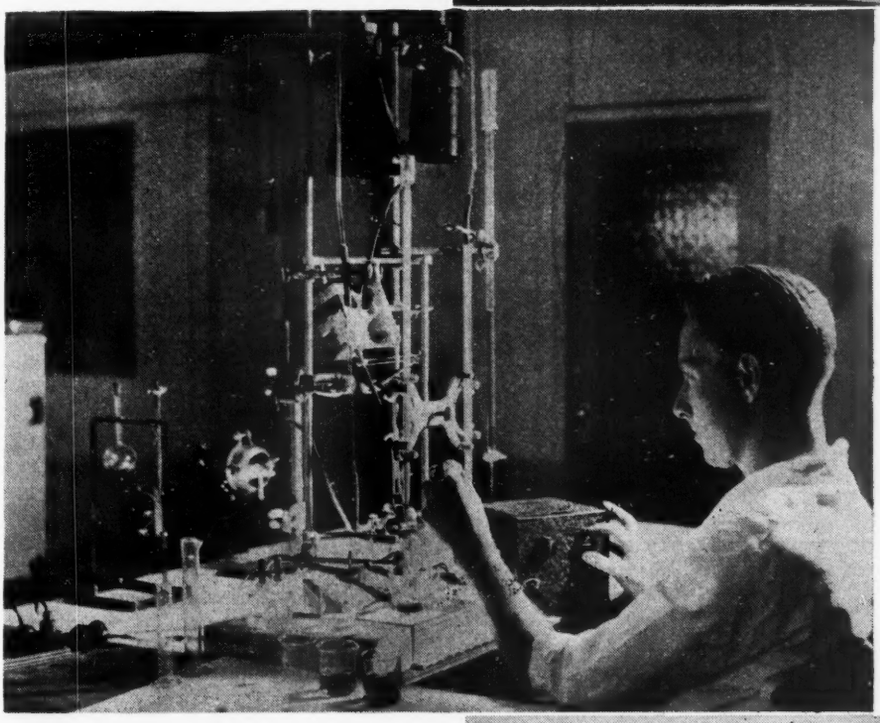




8. The frozen juice is held at −10 deg. F., while in storage. It is shipped as required in refrigerated railroad cars that have been precooled. The car's bunkers are filled with a mixture of ice and salt to provide proper temperature during transportation.

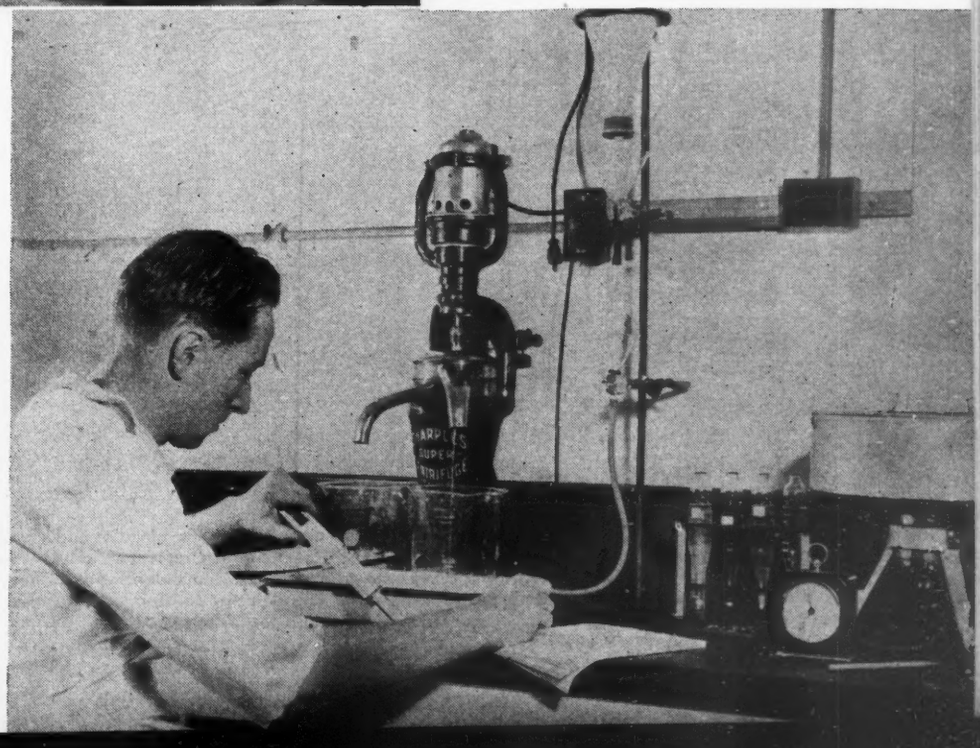
9. For several years the company has conducted, in both laboratory and plant, an exhaustive study dealing with the quick freezing of fruit, fruit juice and vegetables. Samples taken during processing are removed to the laboratory for various tests so that the product may be always up to specifications. This apparatus is used to check the oil content of the juice.





10. Electrometric titration with cathode ray indicator determines the vitamin C content of the juice. One of the most vexing problems in preserving citrus orange juice was the loss of vitamin potency. By processing the juice under refrigeration, along with quick freezing and vacuum sealing, the vitamin content is not affected, but remains consistently high since the product is processed when the fruit is at its best.

11. Centrifuges are used to check the pulp content. The percentages of pulp may vary depending upon the end use of the product, but this percentage must remain uniform in any given batch. It is by such constant checking that the quality of the juice is maintained, while avoiding the terpene-like taste, loss of true flavor, and "stale" odor that are early signs of spoilage.



# DEHYDROFREEZING—

## New Way of Preserving Food

**Space and weight advantage of dehydration is combined with the convenience and fresh-quality retention of freezing, in combination process undergoing successful trials—Saves packaging and refrigeration costs—Quality high**

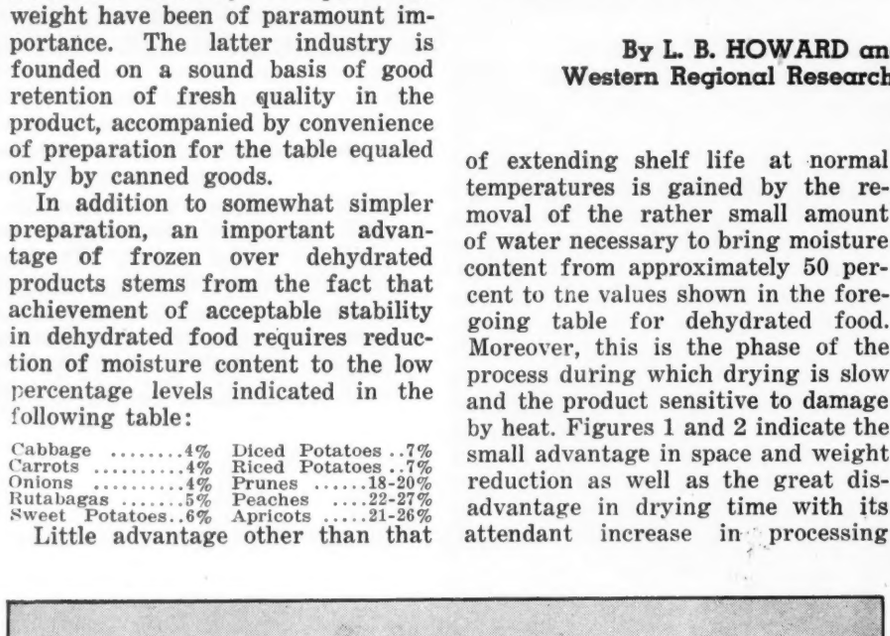
By L. B. HOWARD and HORACE CAMPBELL
Western Regional Research Laboratory*, Albany, Calif.

RECENT years have witnessed phenomenal expansion of the food dehydration and freezing industries. The former owes its present position, in large measure, to the exigencies of war and the fact that economy of space and weight have been of paramount importance. The latter industry is founded on a sound basis of good retention of fresh quality in the product, accompanied by convenience of preparation for the table equaled only by canned goods.

In addition to somewhat simpler preparation, an important advantage of frozen over dehydrated products stems from the fact that achievement of acceptable stability in dehydrated food requires reduction of moisture content to the low percentage levels indicated in the following table:

| | | | |
|---|---|---|---|
| Cabbage | 4% | Diced Potatoes | 7% |
| Carrots | 4% | Riced Potatoes | 7% |
| Onions | 4% | Prunes | 18-20% |
| Rutabagas | 5% | Peaches | 22-27% |
| Sweet Potatoes | 6% | Apricots | 21-26% |

Little advantage other than that of extending shelf life at normal temperatures is gained by the removal of the rather small amount of water necessary to bring moisture content from approximately 50 percent to the values shown in the foregoing table for dehydrated food. Moreover, this is the phase of the process during which drying is slow and the product sensitive to damage by heat. Figures 1 and 2 indicate the small advantage in space and weight reduction as well as the great disadvantage in drying time with its attendant increase in processing cost. "Reconstitution" of dehydrated fruits and vegetables, owing in part to the high temperature and long time of the final drying, is a relatively slow process during which losses of nutritive and flavor values may occur.




**Pictograph shows relation between moisture content and volume of carrots undergoing dehydration. Cylinder at left holds diced fresh material (84.5 percent moisture), which loses water readily. Stepwise dehydration reduces volume as shown. Further dehydration of nearly dry flakes at right is time consuming and expensive. For dehydrofreezing, dehydration is stopped after removal of about two-thirds of the water. Then the food is frozen.**

### Combination Process

Consideration of the foregoing factors led to the design of a number of experiments to explore the possibility of combining the space and weight advantage of dehydrated products with the convenience and fresh-quality retention of frozen ones through partial dehydration followed by freezing storage. Figure 1 shows the economy in weight and space achieved by dehydration of carrots and peas to various moisture levels. In terms of percentage the savings in weight are, of course, dependent on the original moisture content of the material. For example, carrots at 84.5 percent moisture are reduced in weight by half if the moisture content is lowered to 69 percent, while peas, originally 74.5 percent, must be brought to 49 percent to achieve an equivalent weight saving.

### Substantial Economies

Volume shrinkage incident to dehydration nearly parallels weight loss in carrots and peas. Measurements for other products may be expected to reveal similar trends. These economies are very substantial in terms of warehouse or refrigerated transport space. Still more could be expected if the products were lightly compressed. Light

*Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

compression should prove a simple process at the moisture contents involved. Of course, the indicated savings must be discounted somewhat because the gross weights and volumes including the packages must be considered. Appreciable savings in the size and cost of packages should accrue, however.

### Drying Time One Hour

Figure 2 shows a typical drying curve (for diced potatoes) portraying the rapidity of removal of water in that part of the operation of interest in the present connection as contrasted with the slow evaporation in the final phases of the conventional dehydration process. Little if any more than an hour's drying in the usual equipment would be required for attainment of the desired moisture levels. Relatively small dehydrators would suffice for large production, and in this phase of drying high thermal efficiency can be obtained. In addition at least a part of the drying cost would be offset by the reduced load on refrigerating equipment resulting from the smaller amount of water required to be frozen.

### Compared With Frozen Controls

The preliminary experiments have dealt with potatoes, peas, carrots, asparagus, cherries, boysenberries, and apricots. These products, with the exception of boysenberries, were blanched in the preparation process. The products were reduced to a series of moisture contents, frozen at –30 deg. F., and then stored at –10 deg. F. After various periods at this temperature they were presented to taste panels along with controls frozen in the usual way without dehydration. The vegetables were cooked in boiling water, and pies were prepared from the fruits. The results presented in more detail below appear promising, although clearly much research is needed before definite recommendations for individual products can be made with confidence. Suitable fruit and vegetable varieties must be chosen; optimum moisture content must be fixed in each case and means provided for attaining it with satisfactory uniformity; optimum conditions of storage temperature and atmosphere of pack must be determined; further work is needed on methods of preparation for the table. Studies designed to provide solutions for these and related problems are in progress and further reports will be made as the data accumulate.

## "Dehydrofreezing" Introduced— New Combination Method

**"Preliminary experiments with several fruits and vegetables have shown that moderate dehydration (removal of about two-thirds of the water content) followed by freezing storage resulted in excellent products in most cases. Advantages of this new method, tentatively called 'dehydrofreezing,' are savings in weight, space, packaging materials, and refrigeration load." — The Authors.**

### Three-Fold Advantage

No doubt some fruits and vegetables will not react favorably to this method of processing, but at present there seems to be an equal likelihood that certain commodities will yield products superior to those obtainable by freezing alone. The advantages in savings of bulk, weight and packaging materials which may be gained by application of the procedure justify its careful consideration, even though it should prove useful for only a few commodities. Recent proposals for high altitude freezing of foods during air transport might assume a position of greater practicability if they could include this method of processing. The freezing process and

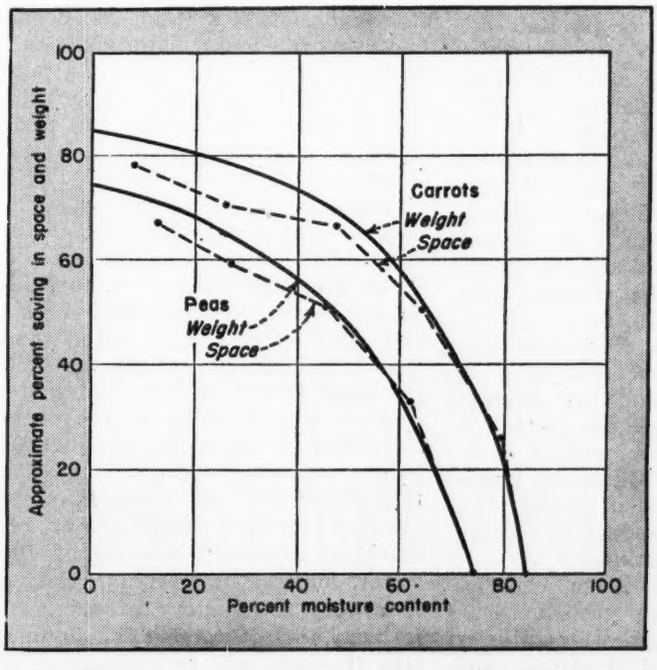



FIG. 1. Shows approximate savings in space and weight for peas and carrots as a result of dehydration to different moisture levels.

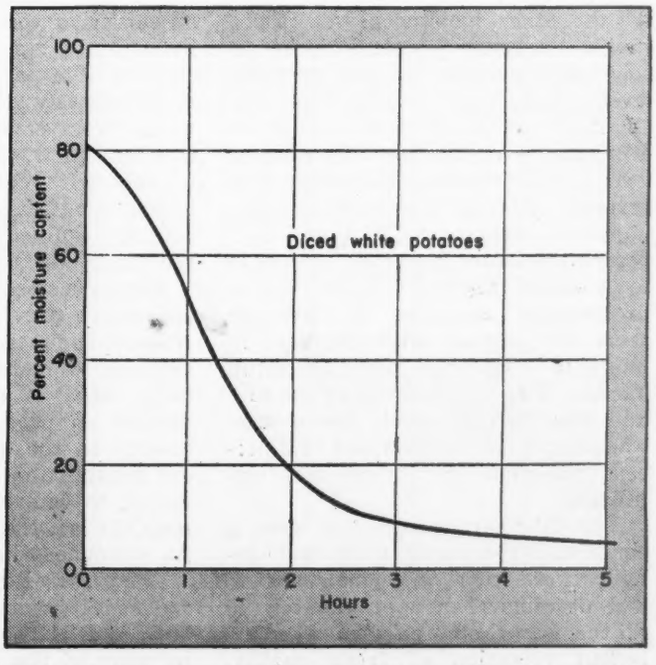



FIG. 2. Rate of removal of water from diced white potatoes during dehydration. Most of the water is removed in the first two hours.

### Advantages of Dehydrofreezing

**Economic and engineering advantages are intrinsic in the new dehydrofreeze process. Initial trials suggest commercial application to a variety of products, although not to all. Benefits of dehydrofreezing, according to the authors, are:**

1. **Products are easier to "reconstitute" than if dehydrated.**
2. **Weight and volume are less than with conventional freezing.**
3. **Substantial economies are effected in packaging materials.**
4. **Partial dehydrating reduces load on refrigeration system.**
5. **Certain commodities yield products which are superior to those obtained by freezing alone.**
6. **High altitude freezing of foods sent by air may be practicable if dehydrofreezing is employed.**

equipment for accomplishing it may be considerably simplified and storage facilities greatly expanded without increased cost. The possibility of better storage stability of products prepared by this new process than by ordinary freezing remains to be demonstrated by longer and more comprehensive storage tests now under way.

### Data Summarized

A brief discussion of each of several products to which the procedure has been applied follows:

Peas: Green peas consisting of a composite sample of sieve sizes 3, 4, 5, and 6, dehydrated to moisture levels of 61.8, 46.4, 27.4, and 13.2 percent from an original content of 74.6 percent, were frozen and compared with a control sample of undehydrated but frozen peas. The peas dried to 61.8 percent moisture retained their color fully and were comparable to the control sample. At the other moisture levels there was a progressive deterioration in color with decrease in the moisture level. Color deterioration was only slight at the 46.4 percent level, however, and even at the 13.2 percent level it could not be regarded as very serious. Flavor deterioration was apparent only in the 27.4 and 13.2 percent moisture materials, and only to a slight degree. There was a progressive decrease in average score for texture with decrease in moisture level, the peas becoming harder. For the material at the 61.8 and 46.4 percent levels the change was slight; for the 27.4 and 13.2 percent materials the change was significant.

For this particular lot of peas a conservative conclusion is that dehydration from 74.6 moisture to 61.8 or removal of approximately 45 of the water, was effected with excellent retention of fresh quality. The sample reduced to 46.4 percent moisture also yielded a very good product which compared very favorably with material handled and frozen in the normal manner. In this case approximately 70 percent of the water was removed with a consequent weight and space saving roughly equivalent to 53 percent.

Carrots: Diced Imperator carrots (3/16 x 3/8 x 3/8 in.), dehydrated to moisture levels of 79.9, 64.8, 48.2, 26.4, and 8.8 percent from an original content of 84.5 percent, were frozen and compared with undehydrated but frozen carrots as a control sample. There was no significant difference between samples with respect to color, carrot flavor, and sweet taste. All samples were comparable in texture. The material dried to 26.4 and 8.8 percent moisture was not as plump as the other samples, but the shrinkage was not severe enough to detract seriously from the appearance of the product.

For this particular experiment a conservative conclusion is that dehydration from 84.5 percent moisture to 48.2 percent, or removal of approximately 83 percent of the water from carrots, resulted in an excellent product that compared favorably with carrots frozen in the normal manner. This reduction was roughly equivalent to a 70 percent reduction in weight and volume.

Asparagus: An experiment with asparagus proved to be a failure. None of the samples, which had been reduced to moisture levels of 87.3, 63.6, 48.8, 19.5, and 6.7 percent yielded a product comparable in quality to the control frozen without dehydration. Failure was largely due to deterioration in color and inability of the product to regain its plumpness in cooking.

Cherries: Royal Anne cherries reduced to moisture levels of 44.9, 33.3, and 24.9 percent were inferior in color to the control sample, and the degree of inferiority increased with decrease in moisture content. With the exception of the sample of lowest moisture content, there were no differences with respect to retention of shape. Moreover, all samples compared favorably in flavor and firmness with the control. It seems probable that if dehydration had been halted at somewhat higher moisture levels the color deterioration would have been unimportant.

Boysenberries: Boysenberries, originally containing 83.7 percent moisture, were frozen at moisture levels of 73.0, 58.0, and 30.9 percent. The cooked products exhibited no differences from the control with regard to retention of shape. The two samples of lowest moisture content were less satisfactory. With the exception of the sample of lowest moisture content, there was no difference in firmness. This sample was much firmer than the others. The only sample showing deterioration in flavor was that of lowest moisture content.

Apricots: Dehydrofrozen samples of apricots brought to moisture levels of 61.9, 38.4, and 18.3 percent from an original content of 83.5 percent did not show significant differences in retention of shape, in comparison with the control. The two samples of lowest moisture content were inferior in color. The fruit dried to the lowest moisture level was somewhat firmer than the other samples. The flavor of the 38.4 and 18.3 percent moisture material was regarded as inferior to that of the other samples.

Potatoes: Diced Oregon Russet potatoes (3/16 x 3/8 x 3/8 in.), blanched and dehydrated to moisture levels of 65.6, 57.9, 48.7, 31.9, and 12.4 percent from an original content of 82.4 percent, were frozen and compared with undehydrated but frozen potatoes as a control sample. No significant differences in taste, flavor, or color were observed between any of the samples and the control. From the standpoint of texture all dehydrofrozen samples were similar and were significantly better than the control material. Even the sample dried to the 12.4 percent moisture level was found to rehydrate satisfactorily with 10 minutes of boiling and without precooking. For this lot of potatoes dehydration to about 12 percent moisture, or removal of about 97 percent of the water, followed by freezing, resulted in a very satisfactory product. It is likely that in commercial production it would not be economical to dry to so low a moisture content.

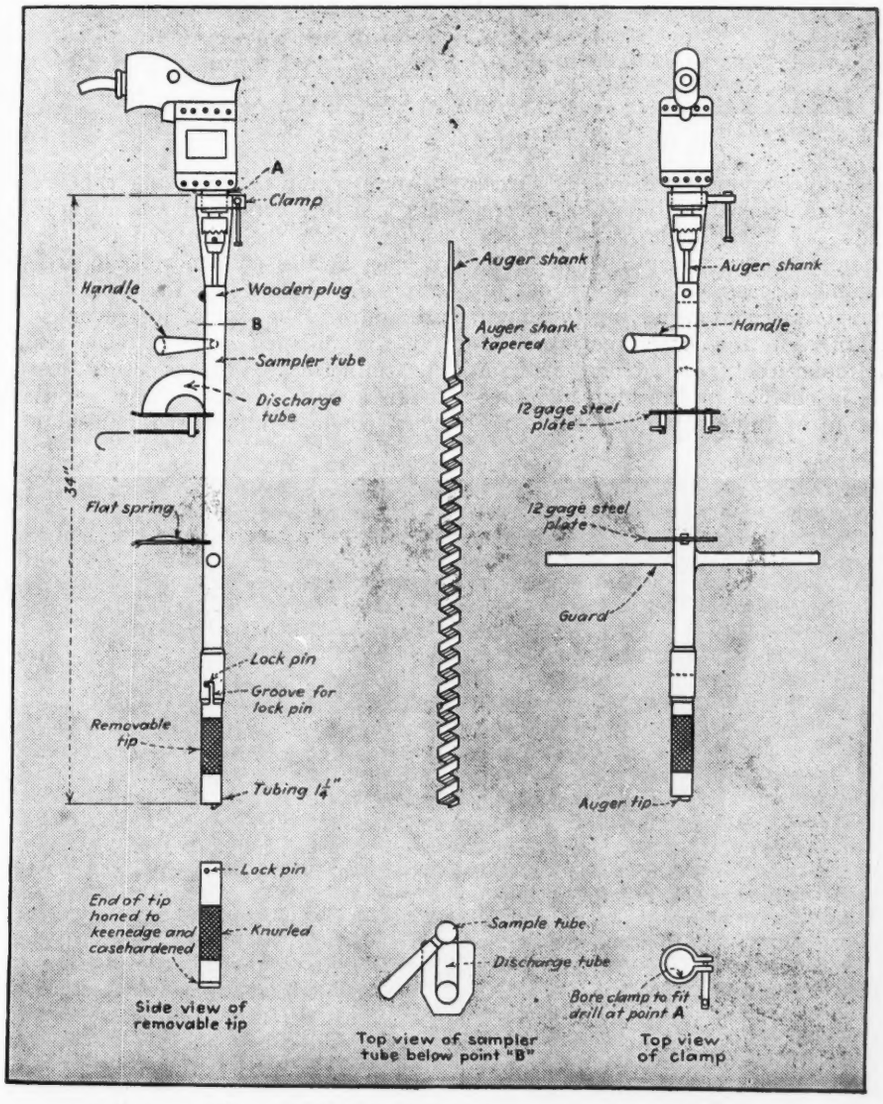
# How Fish Liver Sampler Works

**Electrically operated auger, that rotates within a closely fitting tube, enables man to sample 100 cans of fish livers in 15 minutes. With rapid vitamin A determination, sampling and analysis are completed in one hour**

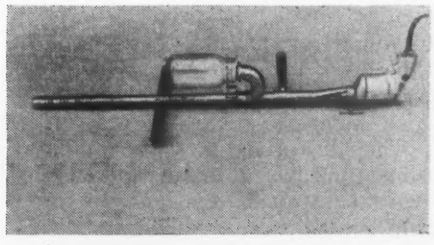
By F. B. SANFORD, Chemist, and L. G. McKEE, Technologist,
Fish and Wildlife Service Technological Laboratory, Seattle, Wash.

THE Seattle Fishery Technological Laboratory, Fish and Wildlife Service, U. S. Department of the Interior, has developed a sampler for rapidly procuring a homogeneous portion of fish livers at the time they are landed at the dock by a fishing fleet. A vessel may bring 100 or more 5-gallon cans of fish livers. The contents of the different cans may vary by several hundred percent in the vitamin A content. Since fish livers are worth up to $10 per lb., it is imperative that a rapid determination of their value be made so that the fisherman can be paid promptly.

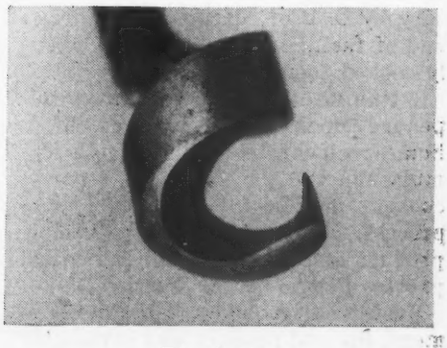
The sampler consists of an electrically operated auger, rotating within a closely fitting tube. As the tube is inserted in a can of fish livers, a sample of the material is conveyed up the tube and out an opening into a sample bottle. Sampling of a 100-can shipment can be done in about 15 minutes. When a rapid vitamin A test is applied to the sample, the value of the shipment can be determined within an hour's time after the fishing vessel docks. This permits payment for the livers on their actual vitamin A content. Previous to the development of this sampler, fish livers were sold on the basis of a flat rate per pound. This meant that many immature fish, relatively valueless as a source of vitamin A, were livered. Payment per pound, however, was the same for these worthless livers as for the larger and more valuable ones. This sampler is doing much to stabilize the industry.




**Detailed drawing of liver sampler.**



**Fish liver sampler assembled.**



**Tip of auger.**

*Swift & Co. photo*

**Assembly production-line method of filling cans with a layer of ham, a layer of dehydrated sweet potatoes, a layer of sugar, and a topping layer of ham was used by Swift & Co. to meet wartime production demands; mechanical fillers were not available.**

# How To Make Canned Ham and Sweet Potatoes

**Here is a new attractive and palatable canned food developed for the U. S. Armed Forces that is easy to prepare for serving. It has potentialities as a new popularly priced civilian canned food item. Ham and sweet potatoes is a popular American dish**

**By CAPT. W. W. BAILEY**
**Q.M.C. Subsistence Research and Development Laboratory, Chicago, Ill.**

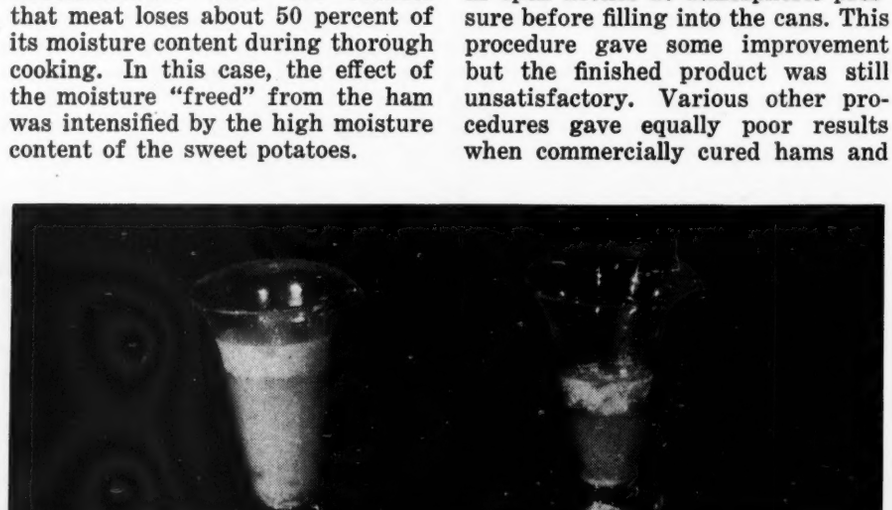
SINCE a canned ham and sweet potato combination had never been made prior to World War II there was no precedent to follow; no similar commercial product to adapt to volume production. Production of this food had to start with some basic recipes, commonly known to good American cooks.

The objective for developing a canned product of a ham and candied sweet potato combination was to obtain a product that would simulate a fresh-cooked home-prepared dish and that would help break the monotony of a canned meat diet made necessary by lack of refrigerated storage and of facilities for preparing freshly cooked foods.

Attainment of this objective depended upon the translation of a home recipe into an industrial formula and the conversion of a home-cookery method into a technological process. Both a commercially feasible product and an industrally practical process had to be developed.

In the early stages of the development, the end product was invariably too high in moisture and "sloppy" in appearance when commercially cured ham and fresh sweet potatoes were used. The unsatisfactory results are understandable when one realizes that meat loses about 50 percent of its moisture content during thorough cooking. In this case, the effect of the moisture "freed" from the ham was intensified by the high moisture content of the sweet potatoes.

An attempt to overcome this excess moisture condition was made by cooking both the ham and potatoes in open kettles at atmospheric pressure before filling into the cans. This procedure gave some improvement but the finished product was still unsatisfactory. Various other procedures gave equally poor results when commercially cured hams and




*Q.M.C. photo*

**Contents of pan and graduate illustrate (a) commercially smoked ham and fresh sweet potatoes, in contrast to (b) dehydrated sweet potatoes with specially cured and smoked ham.**

fresh sweet potatoes were used. Although an improved product resulted when dehydrated sweet potatoes were used, the commercially cured ham remained a cause of trouble.

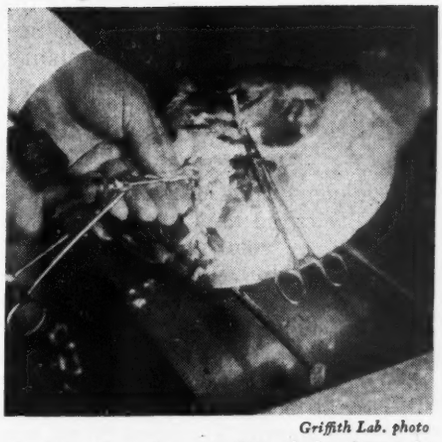
These results indicated that the development of a satisfactory finished product depends upon the selection and preparation of the constituents used, as well as upon the procedure to be followed. Some dehydrated sweet potatoes gave encouraging results; others did not. A satisfactory cure and preparation for the ham was also a problem. Real progress on the solution of the various problems began when the development work started with the selection of the fresh hams and the fresh sweet potatoes to be processed for ultimate use in the canned ham and sweet potato combination.

While the various combinations of constituents were under study, different procedures were also under trial. In its final stage of development, all materials were filled into the cans in a relatively dry state and with no added moisture. This practice was suggested when tests showed that the water "freed" from the ham during retorting supplies the needed moisture to rehydrate the potatoes and to dissolve the added sugar. The correctness of this procedure is evidenced by how well it worked out in large scale production. At the peak of production by Swift & Co., the only packer of the product, this canned item was packed in sufficient quantity to be a component of the "10 in 1" ration for the armed forces which, at that time, was being produced at the rate of 5,000,000 rations per week. The success of the procedure depends largely upon the correct selection and preparation of both the ham and the sweet potato constituents.

### Ham Selection and Preparation

Since the ham constituent of the product gave the most trouble during the development preliminaries, special attention had to be given to the selection, curing and smoking of the hams used. Commercially cured hams had to be ruled out because of their excessive moisture and salt content and also because of unequal distribution of "smoke" flavor throughout their mass.

For those reasons, the procedure finally adopted begins with the use of fresh hams. Further, the ham has to be reasonably lean. As an extra precaution, the hams, although reasonably lean, are trimmed to have a surface layer not to exceed 3/8 in. in thickness. All pelvic fat is removed. This precaution is necessary because "free" fat in canned meats and meat products is objectionable.



*Griffith Lab. photo*

**Rapid and uniform curing of the hams is obtained by arterial pumping, preliminary to submersion in curing solution.**

Immediately after being trimmed, the hams are sent to the curing department for a mild sweet-pickle cure. Control over that cure is obtained by pumping the curing solution into the arterial system of the hams. In that way, a fast, uniform cure results because the ingredients of the curing solution are distributed throughout the ham. Sufficient distribution of the solution is obtained when the weight of the ham has been increased eight percent. Pumping to get a greater increase in weight will likely result in injury to the ham tissue and will give an excessive moisture content to the hams. A 14-lb. ham should be pumped to contain not more than 1.12 lb. of curing solution.

A satisfactory curing solution with a salometer density of from 68 to 70 deg. is made when the following formula is used:

| | |
|---|---|
| Salt | 17 lb. |
| Sugar (sucrose) | 3 lb. |
| Sodium nitrite | 1.6 oz. |
| Sodium nitrate | 1.6 oz. |
| Water (approx.) | 80 lb. |

The pumped hams are packed into tierces, covered with a curing solution, and put to cure for 7 to 10 days. The "cover pickle" (curing solution) is prepared in accordance with the following formula to give a solution with a salometer density of 54 to 58 deg.

| | |
|---|---|
| Salt | 14 lb. |
| Sugar | 1 lb. |
| Sodium nitrite | 1.6 oz. |
| Sodium nitrate | 1.6 oz. |
| Water (approx.) | 85 lb. |

Although there is a difference of opinion about the function of the various ingredients in the curing of meat, it is agreed that salt gives most of the preserving effect and that sugar softens the meat fibers and improves the flavor. Sodium nitrite and sodium nitrate do have some preserving effect, but their main function is to develop and set the desired cured meat color. Sodium nitrite fixes the color in a few minutes; sodium nitrate requires several days to give equivalent results. When a combination of the two is used for this specially cured ham, a more desirable and lasting color is obtained.

*Swift & Co. photo*

**Cured hams are skinned, boned and stripped of excess fat and connective tissues.**

*Swift & Co. photo*

**Shallow open-mesh trays, filled with ham pieces, are subjected to hardwood sawdust smoke for 3 to 5 hours at 130 deg. F., depending on the volume and density of the smoke in the smokehouse.**

Approximately 4½ gal. of the "cover pickle" are required per 100 lb. of meat to cover the hams properly for curing. To assure uniform curing, the hams are removed from the cure on the third or fourth day, packed into another tierce, and again covered with curing solution. This practice allows portions of the hams previously touching other hams to be in direct contact with the curing solution.

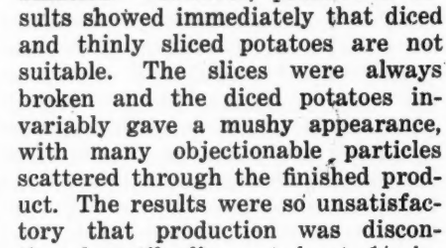
Both to insure the same uniform smoked flavor in each can of the finished product and to reduce its moisture content to the desired level, each ham has to be cut into approximately 2 to 2½-in. pieces before smoking. During this cutting operation the fat on each piece of ham is again checked. Any piece of meat with fat in excess of ⅜ in. in thickness is either discarded or the fat is trimmed to that thickness. After the cured hams are cut into pieces they are spread from 4 to 5 in. deep on a clean woven-wire tray and placed on a rack suspended from an overhead trolley conveyor and covered with a clean cloth of suitable material to permit ready penetration of smoke and, at the same time, to prevent combustion materials from falling on the meat. The racks carrying the ham pieces are run into smokehouses and smoked from three to five hours at a temperature of 130 deg. F. Care is taken to see that the hardwood sawdust, used to make the smoke, is free from all foreign material and is of high smoke quality.

### Sweet Potatoes—Selection and Preparation

The fresh sweet potatoes selected to be dehydrated for use with the specially cured ham are deep yellow to pink in color and of excellent cooking quality. Poor cooking potatoes often present a hard, woody texture or become so mushy after cooking that they lose their identity. Many lots of sweet potatoes were discarded because of these defects. Potatoes having a green to light yellow color are also discarded. After being sorted, the potatoes are thoroughly washed and inspected to remove all diseased potatoes. In the course of this inspection, both ends of the potatoes are clipped off. After washing and inspection the potatoes are heated at 130 to 135 deg. F. for 30 minutes and peeled preparatory to cutting into slices ¼ in. thick.

Preliminary tests indicated that cutting the dehydrated potatoes into slices ⅛ in. thick or dicing them ⅜ in. thick are satisfactory for a canned ham and sweet potato combination. However, production results showed immediately that diced and thinly sliced potatoes are not suitable. The slices were always broken and the diced potatoes invariably gave a mushy appearance, with many objectionable particles scattered through the finished product. The results were so unsatisfactory that production was discontinued until slices at least ¼ in. thick were available.

Thickness of slices is only one of the relatively rigid specifications that have to be met. Before dehydration, the slices are blanched in live steam until the test for peroxidase shows that the enzymes are satisfactorily inactivated, usually not exceeding 6 minutes under atmospheric pressure. Also, to insure best storage qualities, particularly when the dehydrated slices are to be kept several months before canning, the sliced potatoes are dipped or sprayed with sodium sulfite solution before drying. The sulfiting treatment is controlled so that the dehydrated slices contain not less than 200 nor more than 500 p.p.m. of $SO_2$. Color retention in the sulfited potatoes is much better than in the untreated potatoes.



*Q.M.C. photo*

**Finished product, when heated in can and emptied into serving dish.**

The desired texture, color and flavor in the finished canned product are assured by applying the following tests to every lot of freshly dehydrated potatoes:

**1. Rehydration and Cooking**—Before the dehydrated potatoes are passed for use in canned ham and candied sweet potatoes they must rehydrate and cook to approximately their original sliced form when 4 oz. of them are added to 16 oz. of water at 75 deg. F., soaked for 15 minutes, brought to a boil within 10 to 15 minutes and simmered until tender in not more than 30 minutes.

**2. Color**—The rehydrated and cooked slices are required to have a bright color similar to the cooked fresh potato of the same variety.

**3. Flavor**—The rehydrated and cooked potatoes must have a typical flavor and be entirely free from sourness and bitterness.

**4. Texture**—The rehydrated and cooked potatoes in the mixture must be soft and tender but not soggy or gummy.

Although all of these tests are important in controlling the quality of the finished product, the texture test is of special importance.

### Filling, Closing, and Retorting

When the desired quality of ham and sweet potatoes were determined, many of the troublesome problems were solved, but not all. The proper proportions of constituents had to be determined. A satisfactory way of packing or filling the cans had to be adopted. A protective procedure for sealing and retorting the filled cans had to be followed.

The formula finally adopted for commercial production is as follows:

| | |
|---|---|
| Smoked ham pieces | 77 lb. 6 oz. |
| Dehydrated sweet potato slices | 11 lb. 5 oz. |
| Sugar (sucrose) | 11 lb. 5 oz. |
| Total weight | 100 lb. 0 oz. |

Because the ham is smoked in small pieces at a relatively high temperature, it is fairly dry and crusty on the surface with a normal internal moisture content. The potatoes and sugar are dry.

During some of the early produc-

(*Turn to page* 204)

*l. p. 680)*

# Protein Hydrolysates — Flavor Ingredients for Foods*

**Acid digestion of casein, corn or wheat gluten yields an amino acid mixture with a meaty or other flavorful taste. The digest is clarified, neutralized and dried for addition to soups, sauces, meat products and spice mixtures**

By LLOYD A. HALL, Director of Research, Griffith Laboratories, Inc., Chicago, Ill.

INCORPORATION of protein hydrolysates in foods is either for the purpose of increasing nutritional value or else for improving the flavor of the products in which they are used. The objective of our laboratory has been primarily to manufacture hydrolysates for use in food products for the enhancement of flavor, without adversely affecting keeping qualities or palatability. We make no pretense of using the materials for their nutritional value, since they cannot add any appreciable nutritive value in the concentrations in which we employ them.

Many patents pertaining to protein derivatives have been issued. Some of them deal with "protein hydrolysates" and some with "flavoring materials" made of hydrolyzed proteins. These patents are evidence of the considerable interest in and the amount of work that has been done to develop protein hydrolysates for profitable use by the food industry.

Twenty-two amino acids are commonly found in foods. Among them are ten which are considered necessary for good nutrition. They are the so-called "essential" amino acids. Although nutrition is not the basis of our utilization of protein hydrolysates for food purposes, presence of these "essential" amino acids in the hydrolysate is desirable. Determination of the value of the various amino acids by animal experimentation is, of course, a long and difficult procedure. It is, nevertheless, possible that future work may show many of the so-called "non-essential" amino acids to be necessary to good nutrition.

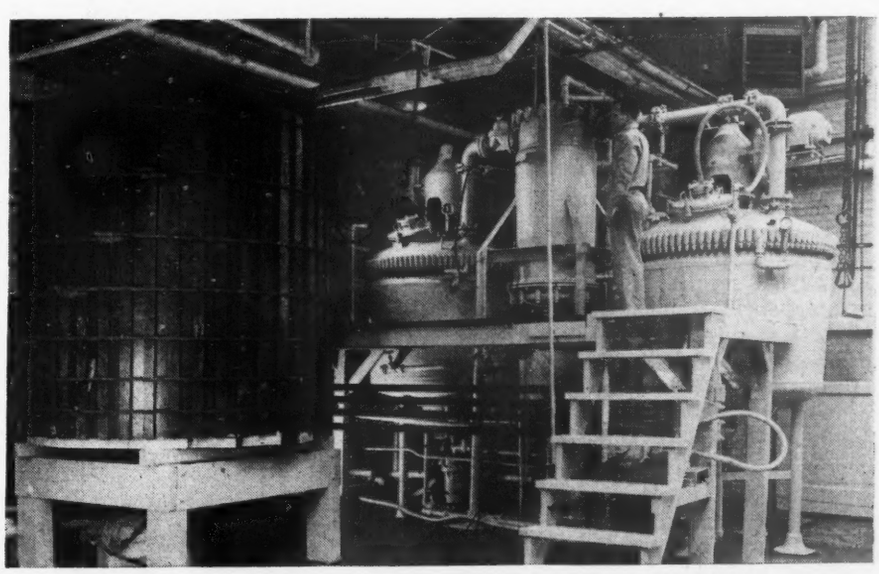
To the best of our knowledge, the first commercial use of hydrolysates was in China and Japan about 1908. Several patents pertaining to them were granted to the Japanese scientist, Ikeda, in 1912. The Japanese were the first to make commercial use of mono-sodium glutamate, one of the salts of glutamic acid. It was used to impart or intensify a meat flavor, especially in soups, broths, gravies, and like foods.

### Production of Glutamate

Until 1935, most of the mono-sodium glutamate used in this country was purchased from Japan. About 1935, domestic commercial production of mono-sodium glutamate from wheat gluten began. Shortly afterwards commercial production of it from Steffen's waste water, a by-product from beet sugar factories, was started by an Ohio plant.

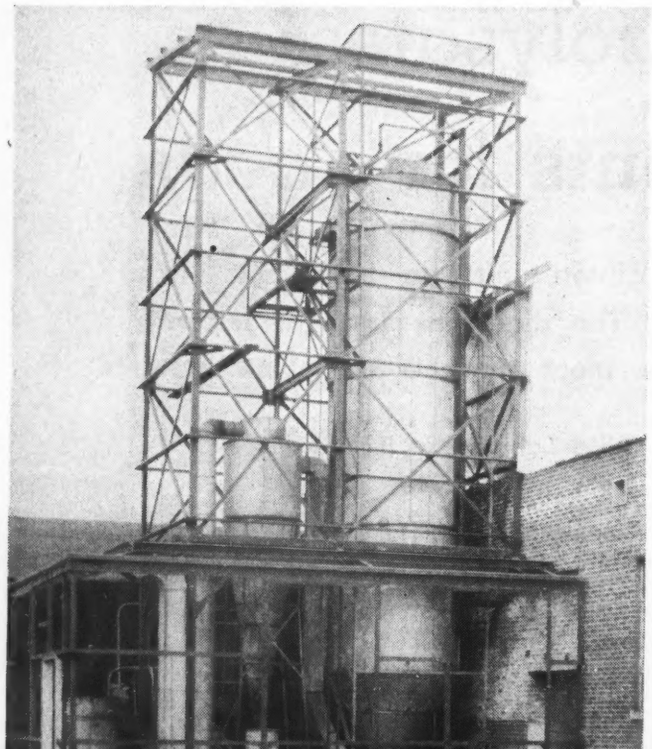
The proportion of the various amino acids in the hydrolysates varies with the protein material used. Wheat and corn glutens, yeast, soybean meal and casein are the most commonly used proteins. Very few proteins, however, are complete with respect to their amino acid content. Casein is probably the most complete protein we have.

Because of the differences in the amino-acid content of protein, one of the important steps in the making of protein hydrolysates is to find the right protein to use. Various proteins have been analyzed to learn which give the best hydrolysate with the best possible flavor value. We believe that a mixture of corn and wheat glutens and casein gives the best product for flavor, as well as for nutritive value. Accordingly, we use these proteins in our manufacturing.



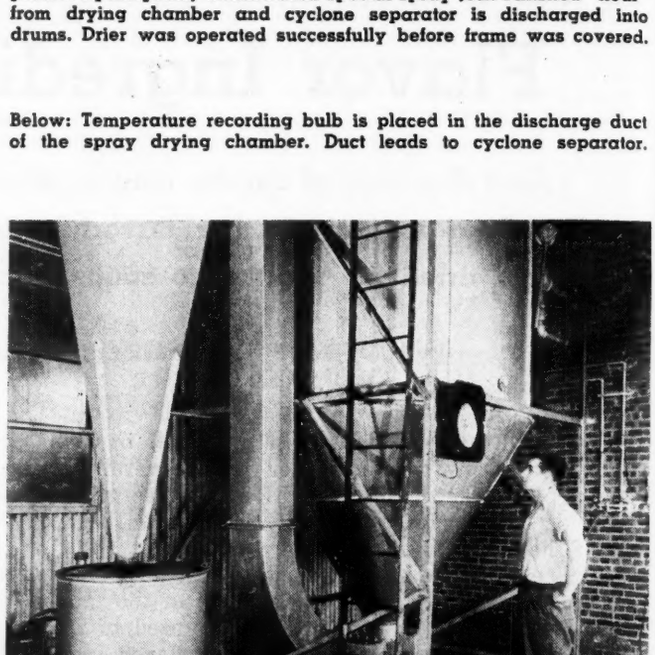
**Two glass-lined reaction kettles of 500 gallons' capacity are used for the acid hydrolysis of the various proteins. They are steam jacketed and fitted with agitators. Between kettles and next to operator is double-pass condenser used for distilling off the hydrochloric acid after the digestion is finished. Large coated tank at left holds mixture for dilution.**

*Based on a talk given before the Chicago Section of the Institute of Food Technologists.



Left: Spray drying equipment was specially engineered for handling protein hydrolysate, which needs special spray jets. Finished "flour" from drying chamber and cyclone separator is discharged into drums. Drier was operated successfully before frame was covered.

Below: Temperature recording bulb is placed in the discharge duct of the spray drying chamber. Duct leads to cyclone separator.



### Three Basic Methods

The three types of hydrolytic methods which may be used are: (1) enzymic hydrolysis; (2) alkaline hydrolysis; and (3) acid hydrolysis.

Enzymic hydrolysis is usually carried out with pancreatic trypsin and papain, which are two of the several well-known proteolytic enzymes. Use of enzymes requires close control to the optimum pH to obtain desired results. In the case of pancreatin this pH is 8-8.5. Our experience with enzymes is that not more than 75 percent hydrolysis is obtainable. This is one of the reasons why enzymic hydrolysis is not more widely used. Another reason is the reluctance to use enzymic hydrolysates for medicinal purposes. Incomplete hydrolysis results in a high content of polypeptides and peptones. Recent reports suggest, however, that some of the polypeptides and peptones resulting from incomplete hydrolysis of proteins are not cause for worry in connection with intravenous injections. These results may ultimately cause a change in attitude towards enzymic hydrolysis of proteins.

Good hydrolysis is possible with papain, the pH range being 7.0-8.0. We have never been able, however, to obtain complete hydrolysis or even get any amino acid with pepsin. Much more research work on enzymic hydrolysis is needed. According to reports, considerable work is actually underway to determine why pepsin does not function as a proteolytic enzyme in these cases.

Alkaline hydrolysis of proteins is often preferred over the other methods because it is not destructive to the tryptophane content of proteins. When the alkaline method is used, tryptophane does not have to be added to the hydrolysate as is the case with acid-hydrolyzed proteins. It has another advantage in that very little humin is formed. It has the disadvantage, however, that its hydrolysate does not contain all the amino acids nor does it have the good flavor of the acid hydrolysate.

### Commercial Method

In our work we are chiefly interested in hydrochloric and sulphuric acid hydrolysis. We use for the process a steam-jacketed, glass-lined reaction kettle equipped with an agitator. Briefly summarized, our procedure is as follows:

1. Run the acidified (hydrochloric acid) water into the kettle.
2. Heat to 113 deg. C.
3. Stir in the protein material.
4. Heat at atmospheric pressure for about 9 hours to obtain complete hydrolysis.
5. Filter to remove the humin.
6. Pump filtrate into a glass-lined vacuum kettle.
7. Distil under vacuum to remove about 50 percent of hydrochloric acid content.
8. Dilute with water to the desired specific gravity and add activated carbon to decolorize.
9. Boil for a few minutes and filter.
10. Pump to another kettle and neutralize with sodium carbonate to pH 5.2-5.4 to obtain best flavor value.

Glass-lined equipment and ceramic fittings are used throughout the process to avoid contact of the protein and its hydrolysate with metal.

In its liquid form, the hydrolysate contains about 30 percent solids. It is also marketed as a powder, and as

**TABLE I—Analysis and Hydrolysis Data on Six Protein Samples**

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Percent protein | 83.42 | 75.30 | 51.75 | 63.84 | 74.21 | 93.19 |
| Percent moisture | 7.60 | 5.69 | 6.67 | 5.48 | 8.23 | 4.17 |
| Percent fat | 0.31 | 4.92 | 4.51 | 2.18 | ..... | 2.65 |
| Hours for hydrolysis | 8 | 7¼ | 7 | 7½ | 5 | 9 |
| Grams amino N/100 Ml. | 3.40 | 3.08 | 2.02 | 2.62 | 2.93 | 3.92 |
| Percent humin | 3.13 | 9.20 | 20.35 | 18.19 | 12.50 | 2.05 |

**TABLE II—Analysis of Representative Commercial Hydrolysate Powders**

| Sample no. | Sodium chloride | Amino nitrogen |
|---|---|---|
| | % | % |
| 1 | 37.60 | 4.76 |
| 2 | 39.96 | 5.48 |
| 3 | 47.93 | 4.80 |
| 4 | 43.55 | 3.89 |
| 5 | 43.56 | 4.33 |
| 6 (with 25% starch) | 28.58 | 3.92 |
| 7 | 65.76 | 1.97 |
| 8 | 34.48 | 5.73 |
| 9 | 47.79 | 4.88 |
| 10 | 45.82 | 4.49 |
| 11 | 51.35 | 3.66 |

**TABLE III—Analysis of Representative Commercial Liquid Hydrolysates**

| Sample no. | Solids | Sodium chloride | Amino nitrogen |
|---|---|---|---|
| | % | % | % |
| 1 | 45.83 | 15.85 | 3.17 |
| 2 | 29.96 | 10.71 | 1.72 |
| 3 | 38.00 | 21.20 | 1.42 |
| 4 | 27.76 | 20.59 | 0.59 |
| 5 | 57.68 | 11.45 | 1.05 |

**TABLE IV—Analysis of Representative Commercial Hydrolysate Pastes**

| Sample no. | Solids | Sodium chloride | Amino nitrogen |
|---|---|---|---|
| | % | % | % |
| 1 | 87.74 | 41.51 | 3.81 |
| 2 | 70.88 | 28.95 | 3.84 |
| 3 | 87.12 | 56.19 | 2.50 |
| 4 | 51.35 | 18.27 | 3.66 |
| 5 | 89.16 | 47.53 | 3.63 |
| 6 | 85.95 | 55.92 | 2.39 |
| 7 | 86.66 | 34.64 | 5.08 |
| 8 | 68.41 | 16.41 | 4.89 |

a paste concentrated to 65 percent solids. Spray drying of the hydrolysate is quite successfully accomplished even though the powder is hygroscopic, a property to which many manufacturers of food products object. The liquid form is preferred because the long heating to obtain concentration has an undesirable effect on the flavor. Some of the amino acids may undergo chemical decomposition.

### Problem of Salt Removal

Although hydrochloric acid hydrolysis gives products of the best flavor, the method has the disadvantage of forming salt when the acid is neutralized. The salt is difficult, almost impossible, to remove. Attempts are being made to eliminate the excess. Results obtained thus far are open to question. Those obtained thus far with ion-exchange resins are too costly to be practical. If the resins could be repeatedly reused, the cost factor would be overcome, but thus far regeneration has not proven entirely satisfactory.

A satisfactory basic formula for acid hydrolysis is:

Mixed proteins ..... 1375 lb.
31 percent hydrochloric acid.. 130 gal.
Water ..... 130 gal.

The proportions of acid and water used give a constant-boiling liquid, boiling at about 113 deg. C. Avoidance of excess hydrochloric acid is helpful. Use of excess acid results in too much salt in the final product, whether liquid or powder. It very likely has an influence also on the hygroscopicity of the final product in powder form.

### Control of Hygroscopicity

Solution of the hygroscopicity problem is not as simple as holding the salt content of the hydrolysate powder to the minimum, however. The real cause of the hygroscopicity has not yet been discovered. Attempts have been made to overcome or control it through:

1. Selection of protein material used.
2. Addition of such materials as glycol stearate or dry starch to the hydrolysate before spray drying.
3. Partial elimination of colloidal humin with reducing agents.
4. Use of minimum quantity of hydrochloric acid to obtain complete hydrolysis.

Selection of protein material used would be to eliminate such compounds as serine which hydrolyzes to pyruvic and acetic acids when boiled with HCl, and pyrrolidone carboxylic acid which hydrolyzes to glutamic acid. Elimination of these products might greatly reduce or even eliminate hygroscopicity of the final product.

Addition of such fatty substances as glycol stearate is for the purpose of coating the particles of the spray-dried hydrolysate, although, in our experience, the improvement is not great. Addition of dry starch to the liquid before spray drying has been tried with some success. Requirements are to mix in the starch at fairly low temperature, not exceeding 49 deg. C., and to spray dry immediately. If the liquid is nearly neutral, there seems to be no conversion of the starch, and results are fairly good. Addition of 15 to 25 percent of starch materially reduces hygroscopicity.

### How Humin Is Formed

Not too much is known about humin and its relation to hygroscopicity in powdered hydrolysates. Colloidal humin, which remains in the filtrate, is thought to result from a condensation of tryptophane with aldehyde material present in proteins. Aldehydes are always present in protein material because there is always some carbohydrate. Tryptophane has an indole nucleus, which will condense with the aldehyde group of the carbohydrate, thus forming the humin. Partial elimination of the colloidal humin can be accomplished with such reducing agents as stannous or titanous chloride or zinc oxide. Such treatment, however, is not generally recommended, primarily because some of the amino acids, such as arginine, seem to be affected.

Aside from the effect of colloidal humin on the hygroscopicity of hydrolysates, the over-all humin prob-

**Uniformity of color has been found as important as close chemical control in setting up standards for protein hydrolysates. Electrophotometric check precedes spray dry process.**

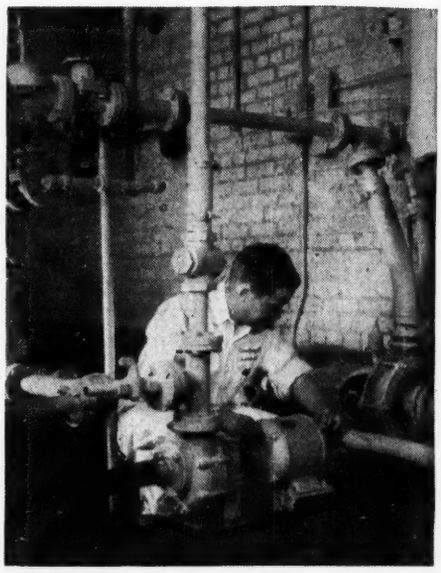
lem is of considerable importance in the commercial production of protein hydrolysates, as it affects the filtering of the acid digest. Quantity, rather than type, of humin seems to be a determining factor in the filtering operation. When wheat protein is used, resulting in only 3 percent humin, filtering is not difficult. Where the humin content runs as high as 9 to 10 percent, filtering is prolonged and difficult. A filtration time of 21 hours has been necessary to remove 200-300 lb. of dry weight humin (about 600 lb. when wet).

### Hydrolysis of "Crackling"

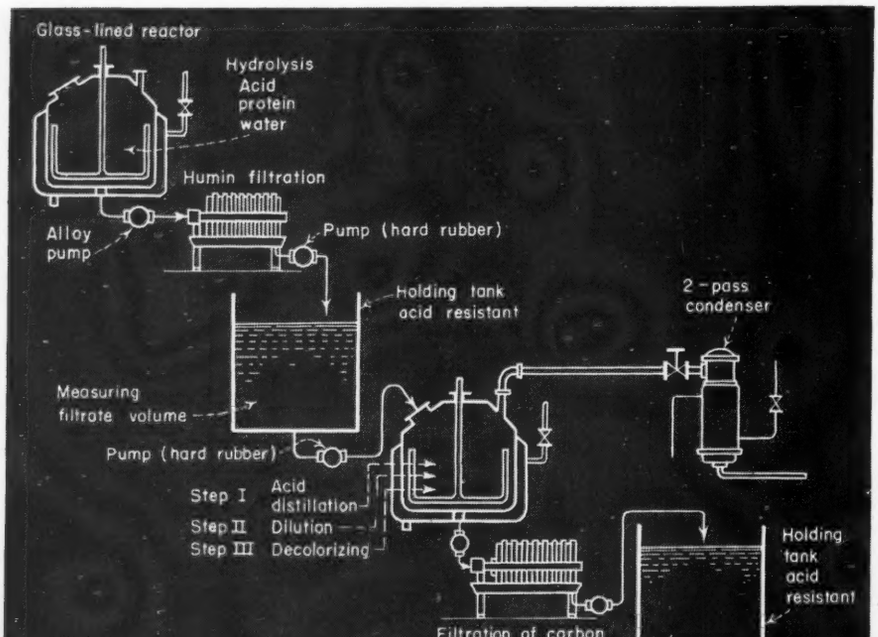
In some of our experimental work we have hydrolyzed different proteins under varying conditions of pressure and temperature to determine, if possible, a relationship between protein material used and the quality of hydrolysate made. In one group of tests we hydrolyzed at 108 deg. C. for 8 hours. When material containing 75 percent protein was used, 9.2 percent humin resulted. When the material contained 56.5 percent protein, the humin percentage was 20.35. When the protein content was 93.19 percent, only 2.05 percent humin was formed. In all cases, the results of the experiments showed that when the material used had a high protein content, the percentage of humin formed was low. The lowest percentage of humin formed (1 percent) was obtained when "crackling" was used. "Crackling" is the protein material left after the fat content of animal tissue has been removed by rendering out as lard and finally by solvent extraction. Its protein content is 93 to 95 percent. The conclusion is that the percentage of humin formed bears a definite relationship to the proportion of proteins and carbohydrates in the protein material used.

Control points in evaluating protein hydrolysates are percent of solids, sodium chloride and amino nitrogen. There is a wide variation

(*Turn to page* 222)



**Hard rubber and special alloy pumps handle the acid digest and clarified hydrolysate.**




**Flow sheet for manufacture of protein hydrolysate by hydrochloric acid digestion process.**

**TABLE V—Typical Analysis of HCl Hydrolyzed Proteins**

| | |
|---|---|
| pH of a 10% water solution | 5.1 |
| Moisture and volatile matter | 4.0% |
| Amino nitrogen | 5.5% |
| Mixed amino acid salts* | 62.5% |
| Sodium chloride | 33.5% |

*The amino acid composition in percent is approximately as follows:

| | |
|---|---|
| Alanine | 9.8 |
| Arginine | 1.5 |
| Aspartic acid | 1.7 |
| Cystine | 1.2 |
| Glutamic acid | 20.1 |
| Histidine | 0.8 |
| Isoleucine | 3.7 |
| Leucine | 19.6 |
| Lysine | 0.1 |
| Methionine | 2.0 |
| Phenylalanine | 6.6 |
| Proline | 9.0 |
| Threonine | 3.0 |
| Tryptophane | ... |
| Tyrosine | 2.6 |
| Valine | 1.9 |

**TABLE VI—Uses for Hydrolyzed Proteins in Food Products**

| | |
|---|---|
| Soups | Macaroni with meat sauce |
| Stews | Poultry stuffing and basting |
| Broths | Chow mein |
| Bouillons | Processed meat |
| Bouillon cubes | Hash |
| Fish | Meat sauces |
| Gravies | Hors d'oeuvre pastes |
| Scrapple | Cheese spreads |
| Sandwich spreads | Pickle relishes |
| Headcheese | Baked beans |
| Mince meat | Pancake flour |
| Sausage meat | Cheese rarebits |
| Curing compounds | Chili sauce |
| Goulash | Salad dressings |
| Biscuits and crackers | Mayonnaise |
| Fruit cake | Dog foods |
| Spice mixtures | |
| Chop suey sauce | |

# CORN STARCH—
# A Versatile Commodity

**This important base commodity with its many properties make it a valuable raw material for numerous food industrial applications. This study covers its many properties and the more important of its numerous industrial applications are outlined**

By NORMAN F. KENNEDY, Director of Research,
Corn Industries Research Foundation, New York

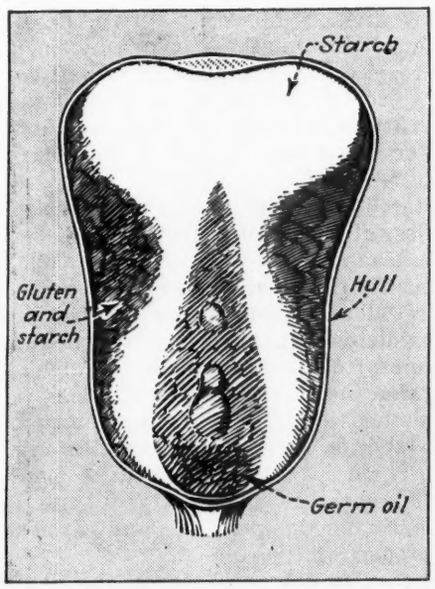



**Fig. 1. Composition of corn kernel.**

ALTHOUGH the commodity chart (Table III), which lists the various food applications of starch, was built up on the basis of the uses that have been developed by the corn wet-milling industry, it is safe to assume that in many of the same uses, starches from other plant sources are and can be used. Chemically, all starches are similar, but physically their characteristics vary with their sources. Variations in physical properties such as granule size, pasting qualities, flavor, and viscosity characteristics may indicate a preferential selection of a starch from a specific plant source. In the main, however, selection for the various uses is decided on the basis of cost and available supply.

With the development and refinement of modern separation and modification technics, it has been possible to alter the physical properties of starch from any source to cover a wide range of uses. In fact, it might be said that the application of starch to commodity use has become a specification and prescription business. Thus, though tapioca, for example, may be preferred for such uses as postage stamp dextrin and envelope gum, the volume of such preferential use, on the basis of technological necessity, is small in relation to the total uses of starch. Corn has attained its predominance as a major domestic source of starch because it yields a greater volume of starch per acre, at a lower cost, than any other domestic cereal or tuber and because of the large volume of supply available under normal conditions. In 1942, although the corn wet-milling industry milled 130,000,000 bu. of corn and produced over 4,500,000,000 lb. of starch for various products, it utilized only about 4 percent of the total crop of that year.

Tapioca, which under normal conditions has a favorable cost advantage over corn because it is produced with low cost labor and enters this country on the free list, was virtually eliminated by war conditions. For the relatively small number of uses in which tapioca is considered essential, developments are under way in this country to duplicate the properties of tapioca starch. Seed strains of waxy corn and waxy sorghum, grown by several leading Agricultural Experiment Stations, yield starches duplicating the properties of tapioca starch in every essential respect. Growing programs are under way that in a few years can produce a sufficient quantity of these waxy grains to take care of all needs at present thought to be essential.

Since the starch most widely used under present conditions is derived from corn, its application as an industrial commodity will be discussed from the point of view of the products of the corn wet-milling industry. The diagram of the corn kernel (Fig.

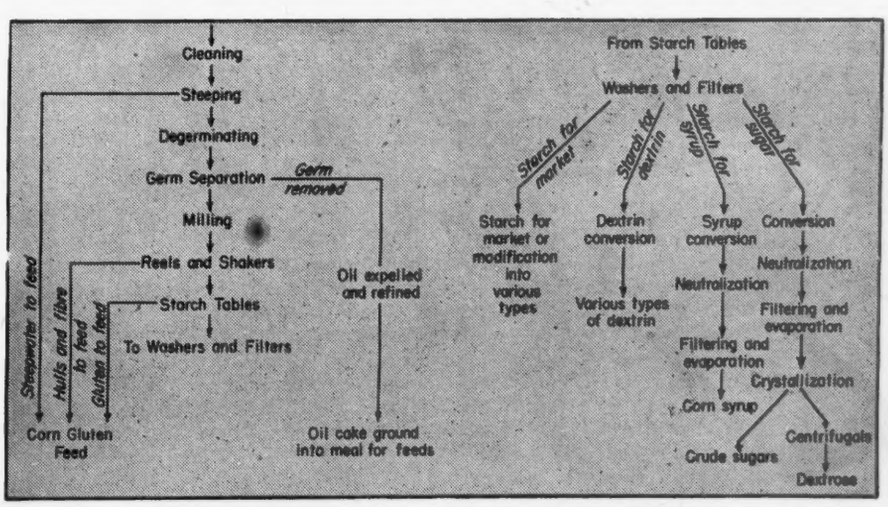



**Fig. 2. Flow Chart of corn refining, showing end products.**

1), together with the analysis of its dry substances (Table I) and its yield of products on a per bushel basis (Table II) indicates the major extractives and the predominance of starch among these extractives. Marketing and the utilization of the protein, oil and other byproducts is another factor that enters into the relatively low cost of domestic corn starch, because the return from the byproducts reduces the raw material cost of starch as the major component of the kernel.

### Wet Milling

The extraction process employed by the corn refining industry is known as wet-milling. This means that the germ and oil separation from starch is carried out primarily in chemically treated water, resulting in purer products than are possible by mechanical dry-milling technics. In the hundred years in which the industry has been in existence, many technical improvements have been made in the manufacturing process. These have resulted in more purified products for additional treatment and modification than is possible under any other mass production separation process. The simplified diagram of the corn refining processes (Fig. 2) indicates the major steps through which the corn kernel goes in order to break it down into its several marketable derivatives.

Approximately two-thirds of the starch produced by the corn refining industry is diverted to the refinery for the manufacture of the sirups and sugars whose widespread use in food compounding and in other industrial uses has already been discussed in a previous issue of FOOD INDUSTRIES.* The commodity uses of the forms of starch as such, which make up the remaining third of total production of the industry, are extended over a very wide industrial and food field. It might be said that starch enters into the daily lives of most all of us in the foods we eat, in the clothes we wear, in the houses we live in, and in many of the materials we use in our daily occupations.

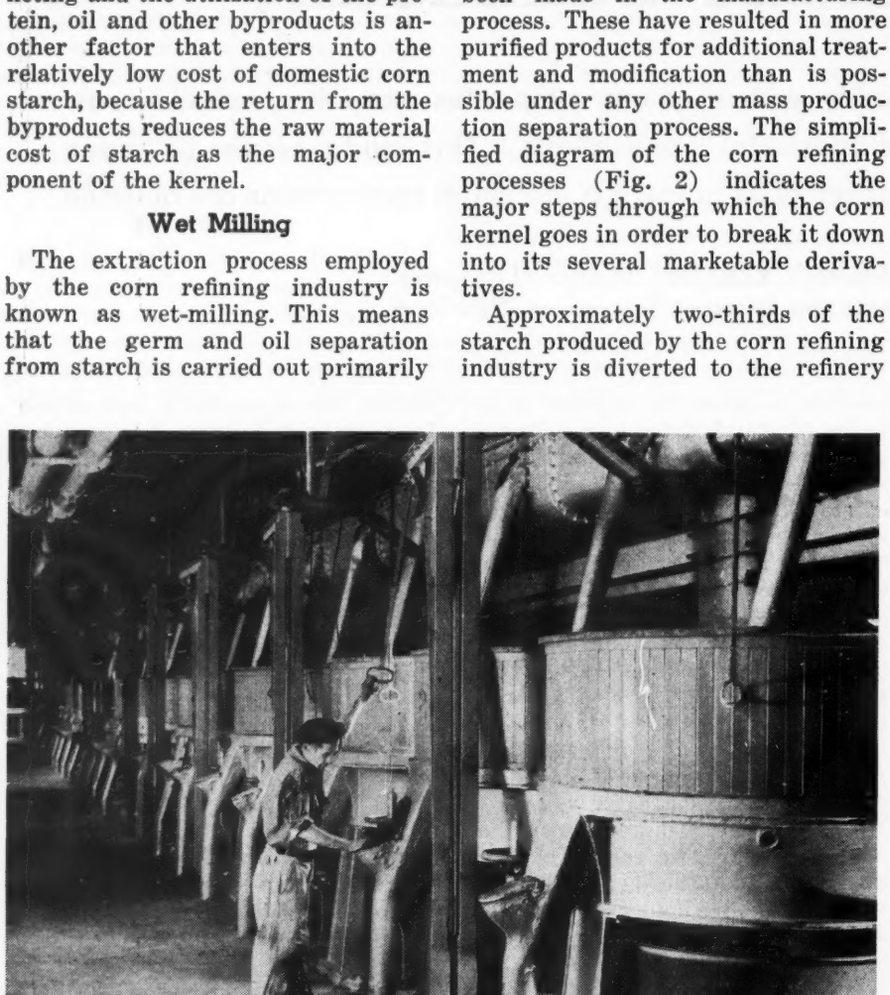


Fig. 3. Buhr mills to grind gluten, starch and fibre.

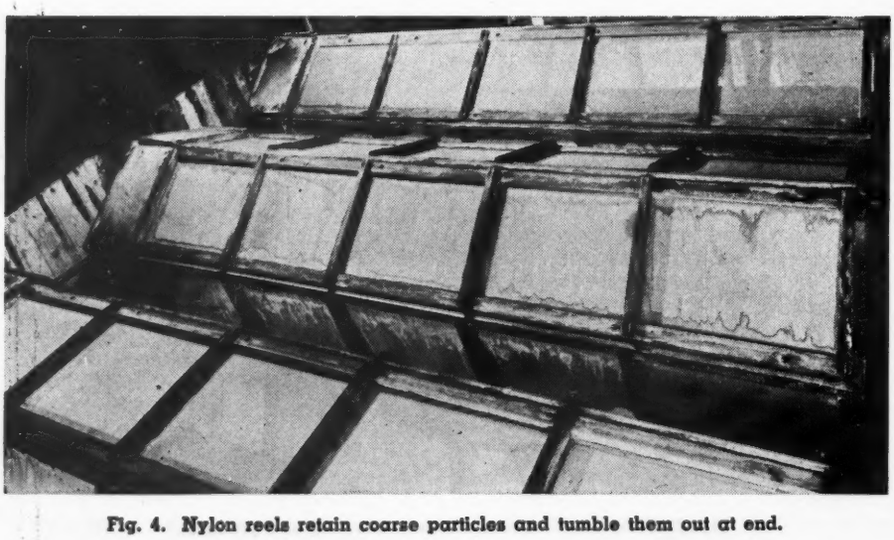


Fig. 4. Nylon reels retain coarse particles and tumble them out at end.

### Classification

As shown in Table III, the forms of starch applied to different uses are divided into six main classifications. Within these type divisions are also many ranges of variations in such properties as solubility, viscosity, and water-carrying capacity. The variations depend on the character of the treatment given to starch to modify its physical properties. Modifications are carried out in a number of ways: by heat alone, heat in the presence of mineral acids, by alkalies, and by a number of oxidizing agents, or by a combination of different methods.

Because of the wide variations in methods of treatment, to accomplish a specific result for a specific use, perhaps an attempt should be made to generalize the six types into 3 levels, on the basis of their physical properties:

1. The untreated starch, the alkali modified group, most gelatinized starches, and those prepared for enzyme action, fall, for the most part, into one level of physical properties. Such starches are essentially insoluble in cold water, have a high viscosity, and a high-water-carrying capacity;

2. The thin boiling and some of the oxidized starches fall into the second level. They are still essentially insoluble but have medium viscosity and medium-water-carrying capacity;

3. At the third level are to be found the dextrins and other oxidized starches. These are essentially soluble, with thin viscosity and low-water-carrying capacity.

At the end of the ranges in these levels, one property may merge with another property in the preceding or succeeding level. The difficulty of any accurate classification is evi-

*Dextrose as an Industrial Commodity. John Krno, FOOD INDUSTRIES 6, 107, 1934.

denced by the fact that some of the gelatinized starches may, on further treatment, be so modified as to be included in the third level, as measured by physical properties.

### Untreated Starches

For most food purposes, untreated starch can satisfy major requirements. The form in which this starch is produced for market is due to the mechanical methods used in handling it. The speed of drying contributes most to its final form. If the drying is completed within a few days, the product obtained is a mixture of starch powder and larger particles, and contains 12½ to 13½ percent moisture. This form, known commercially as *pearl starch*, is the basic starch of the corn refining industry. If the drying process is considerably prolonged, the wet mass contracts irregularly and breaks up into distorted crystals, and the product, known as *crystal starch*, is more suitable than pearl starch for some industrial uses. *Powdered starch*, the form in which most food starch is sold, is prepared by milling pearl starch and bolting it through several silk screens to remove the overdried particles. Starches intended for food are further purified by retabling and washing.

**TABLE I—Composition of the Corn Kernel**

Chemically, 15 to 20 percent of the kernel is water, and the dry substance is made up as shown here.

| | Percent |
|---|---|
| Starch (and other carbohydrates) | 80.0 |
| Protein | 10.0 |
| Oil | 4.5 |
| Fiber | 3.5 |
| Ash (mineral content) | 2.0 |

**TABLE II—Approximate Corn Substance Content per Bushel**

| | Pounds |
|---|---|
| Starch | 33.00 |
| Fiber | 6.5 |
| Protein | 4.0 |
| Steepwater solubles | 3.6 |
| Oil | 1.75 |
| Ash | 0.77 |

**TABLE III—Type of Starch Best Suited for Use in Various Food Applications**

| Foods | Raw | Starch for Enzyme | Dextrin | Pre-Gelatinized | Alkali Thick | Thin Boiling | Oxidized |
|---|---|---|---|---|---|---|---|
| Bakery: | | | | | | | |
| Cakes | x | | | | | | |
| Cookies | x | | | | | | |
| Dusting | x | | | x | | | |
| Flours | x | | | | | | |
| Ice cream cones | x | | | | | | |
| Macaroni | x | | | | | | |
| Pie filling | x | | | | x | | x |
| Prepared mixes | x | | | x | | | |
| Wafers | x | | | | | | |
| Brewing | x | x | | x | | | |
| Canned Foods: | | | | | | | |
| Canned vegetables | x | | | | | | |
| Soup | x | | | | | | x |
| Confectionery: | | | | | | | |
| Caramels | x | | | | | | |
| Chewing gum | x | | | x | | | |
| Dragee | x | | x | | | | |
| Dusting | x | | | x | | | |
| Gum work | x | | | | | x | x |
| Molding | x | | | | | | |
| Pan coatings | | | x | x | | | |
| Dairy Foods: | | | | | | | |
| Condensed milk | | | x | | | | |
| Stabilizers | x | | x | | | | |
| Desserts: | | | | | | | |
| Pudding powders | x | | | x | x | | x |
| Meat Products | | | | | | | |
| Sausage fillers | x | | | x | | | |
| Miscellaneous: | | | | | | | |
| Animal foods | x | | x | x | | | |
| Baking powders | x | | | | | | |
| Condiments | x | | | x | | | |
| Rice polishes | | | x | | | | |
| Salad dressings | x | | | | x | | x |
| Sugar, powdered | x | | | | | | x |
| Yeast | x | | | | | | |

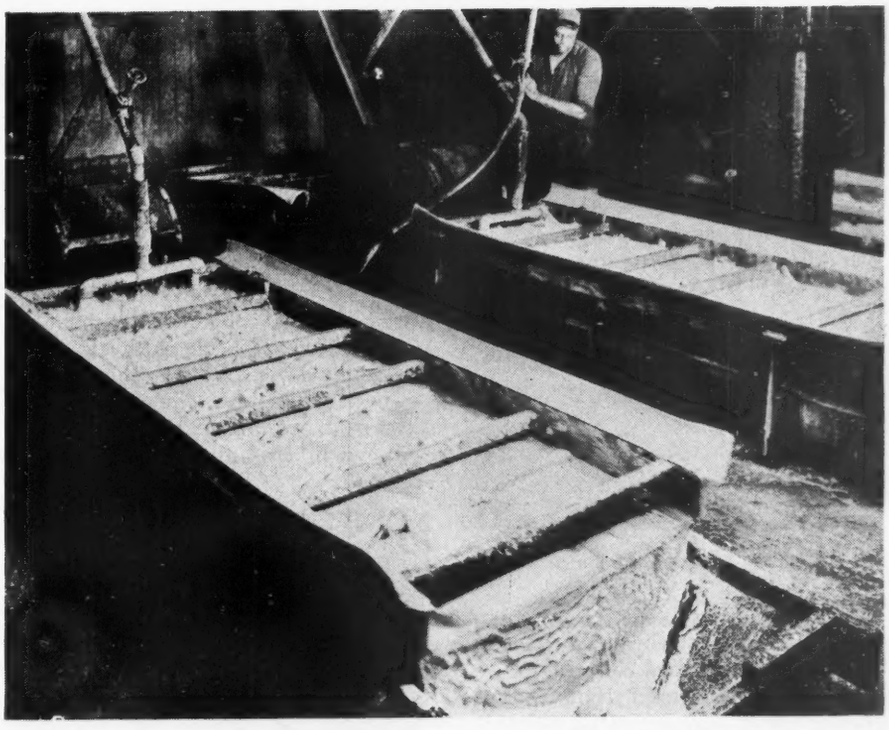


Fig. 5. Starch shakers to remove fibre.

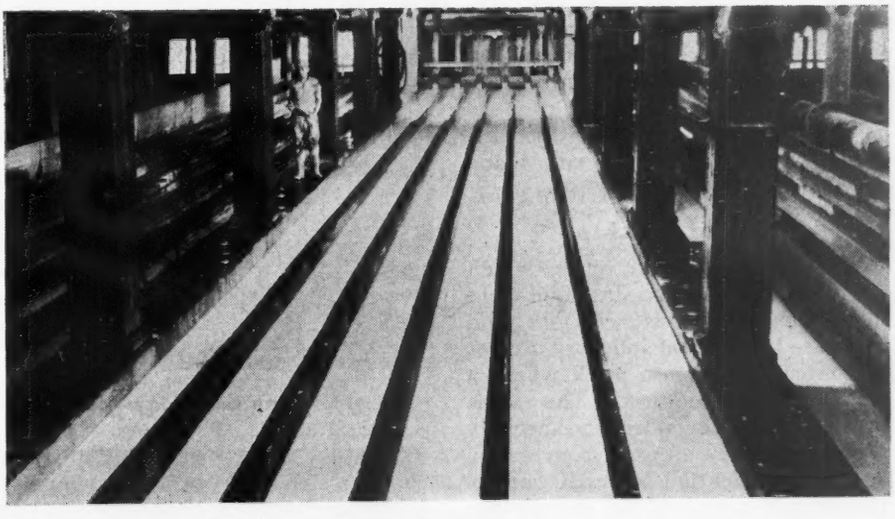


Fig. 6. Starch tables.

Untreated starch is essentially *thick boiling*, that is, it boils to a thick paste. Where differences in the consistency of the paste are required, further treatment with alkali may be used, the type and kind of treatment depending on the use to which it is put. In the food industry, specially treated starch of this nature may be desirable in pie filling, in pudding powders and in salad dressing. In non-food industry, a starch of the thick boiling variety is used to produce the jell-like consistency of the electrolyte mass of dry batteries and must be modified to withstand the hydrolytic action of strong electrolytes. Another thick boiling vari-

Fig. 8. Washing the starch.

ety may be modified to supplant sodium silicate in the production of laminated corrugated containers.

It has been stated that the adhesiveness of starch and its property of forming a smooth surface account for most of its industrial uses. For edible purposes in the food industry. outside of its contribution to the energy food value of food formulas, its usefulness probably depends on stiffening and thickening power or on its ability to hold other food ingredients in attractive form, shape or consistency.

### Treated Starches

The thin boiling starches, which are usually produced by mild acid conversions of the *starch milk,* find little use in the food industry, except in confectionery gum work where a soft gum is required. The same would be true for starches especially prepared for enzyme conversion. Special purification and pH control treatments are used to render the starch suitable for enzyme action, particularly for brewing purposes and the production of paperboard and paper products.

Starches subjected to mild oxidation, the oxygen being derived from such reagents as chlorine, hypochlorite, or hydrogen peroxide, are little used in the food industry but are useful in carrying colors in paper printing, printing of cloth, or in special methods of textile sizing.

The gelatinized starches do, however, find considerable use in the food industry. This type of modified product is prepared by precooking and is made in dry form so that it will be suitable for use when suspended in cold or tepid water. The characteristics of the gelatinized starches depend on the treatment given before gelatinization as well as on the gelatinizing treatment. One used for the brewing industry is a different product from that used by foundries for corebinding purposes. Others of this classification are employed in the baking trade as bread conditioners.

The British gums and the dextrins are the toasted starches and are produced by heat alone or by heat in the presence of such catalytic acids as sulphuric, nitric, or chloroacetic or with ammonia. The characteristics of these products can also be changed by preliminary modification before delivery to the roasting oven. Some of the dextrins are used in the food industry because, in addition to being food products in themselves, they provide some adhesive properties which are valuable, such as, in holding ice cream cones and other pastries in shape. Others provide thin-filmed coatings for confectionery products and still others are useful in controlling the consistency of liquid or semi-solid food products.

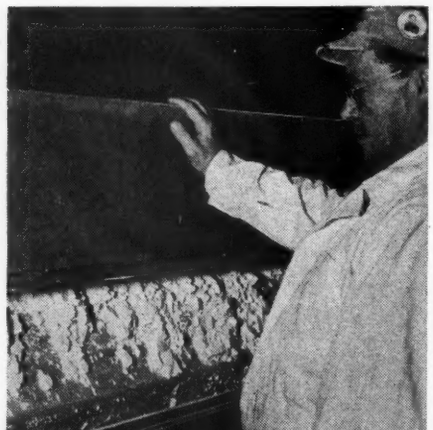


Fig. 9. Starch coming from dryer.

### Custom Built Starches

It is impossible to do much more than list the many uses of the different types of starch. The technological details and reasons for the selection of one type or group of starches for a given industrial use could almost be made the subject of a monograph for every industry which uses starch products. Many of the applications have been made by trial and error, and data are not publicly available on the specific properties thought desirable in any given industrial use. In other words, starches are "custom built" for the trade and it is doubtful whether general fundamental scientific principles can be established that would make the choice of standardized products possible.

### Early History

The first patent relating to starch manufacturing was granted in 1717 (British Patent No. 413) and by the close of that century a few additional patents were issued for the manufacture of rice and potato starch and for the separation of starch and gluten from cereal flours. Literature

(*Turn to page* 220)

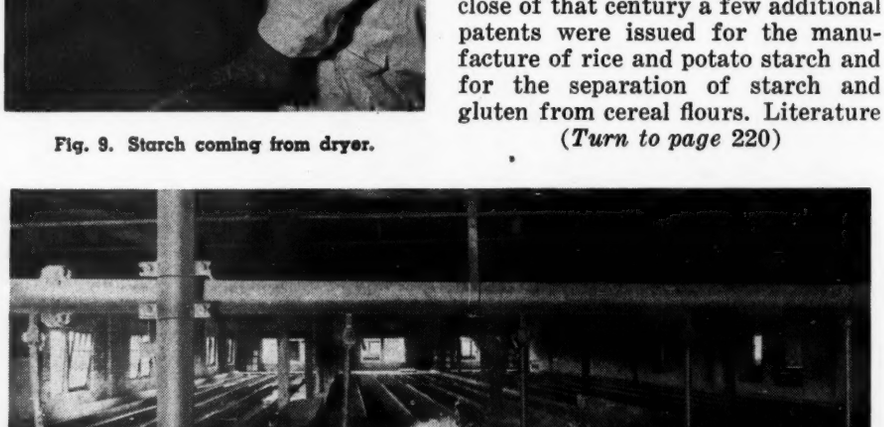


Fig. 7. Flushing the starch.

# HOW TO MAKE GRATING CHEESE

By C. D. DAHLE and G. H. WATROUS, JR.
The Pennsylvania State College*
State College, Pa.

Cheesemaker adds a "starter" of pure culture to the milk in one of the big mixing kettles.

**Homogenizing the cream before adding to skim milk forces the development of fatty acid that confers a characteristic flavor on grating cheese in shorter aging time**

SINCE the war, there has been a scarcity of imports of the highly flavored, dry Parmesan type cheese used for grating purposes. Italy has been the main supplier of this type of cheese so popularly used with spaghetti, soups, and in many foods where it serves as a condiment. To offset the lack of imported cheese, many suppliers have resorted to the use of cheese of a milder flavor and of different body and other characteristics. Phillips[1] produced a cheese having a decidedly characteristic aroma and body for grating. This cheese, which he termed Romano-type cheese, is made from Holstein milk and use is made of rennet paste rather than rennet for the purpose of enhancing the flavor. The characteristic flavor of some types of grating cheese, imported or domestic, is of free fatty acid, similar to butyric.

In the imported cheese, the development of the characteristic flavor, as well as the hard, dry body, is obtained only after a cure from one to three years. Such a long cure of domestically produced grating cheese would make its cost extremely high.

The authors conceived the idea that a type of cheese suitable for grating, for use with spaghetti, could be obtained in a much shorter time by forcing the development of flavor-conferring fatty acid by means of homogenization. The first cheese made proved to be a very satisfactory substitute for the imported type and subsequent cheese have also proved to be very satisfactory.

It was found that a good, characteristic flavor, body and texture could be obtained from raw skimmed milk which was standardized to two percent fat with homogenized pasteurized cream. The lipase in the raw skim milk produced the free fatty acid from the homogenized pasteurized cream. Rennet paste to the extent of ½ lb. per 1,000 lb. was used in control lots of two percent raw milk, but very little flavor developed in 10 months' time, while with the other treatment a good flavor was present in 5 months and an excellent flavor was present in 10 months. It is, therefore, felt that the shorter curing time secured by this method is a distinct advantage over the rennet paste method.

### The Method

1. Good, fresh raw skim milk is standardized to two percent butterfat by the addition of homogenized pasteurized cream. Twenty percent cream homogenized at 110 deg. F. with a pressure of 2,500 lb. was used. This low temperature was used so that the temperature of the milk and cream would not rise excessively.

2. One percent starter is added at 88 deg. F. to develop about 0.02 percent acid.

3. The milk is then set with rennet at a temperature of 88 deg. F., using 3 oz. of liquid rennet for each 1,000 lb. of milk.

4. When the curd is firm enough, as judged by firmness of curd in Cheddar cheese making, it is cut, using the horizontal and vertical knives. The curd is cut as finely as in Swiss cheese making, or about the size of small rice grains.

5. It is stirred for 10 to 15 minutes, after which heating is begun. The curd is heated slowly at first and in 30 minutes the temperature should be 115 deg. F. with constant stirring.

6. The curd is cooked for at least 1½ hours or until it is as firm as a Swiss cheese curd. When a squeezed handful of curd will break up into

(*Turn to page* 206)

**TABLE I—Sequence of Steps in Process of Cheese Making.**

Lb. raw skim: 327.6 lb.
Lb. past. cream: 36.4 lb. (20%)
Homogenization: 2,500 lb. at 110° F.
Fat test skim + cream: 2.0%
Lb. fat: 7.28
Acidity of milk: 0.18%
Starter—
  Kind: Lactic
  % Used: 1%
  Amt. used. 3.64 lb.
  Acidity: 0.89%
  Temp. milk: 88° F.
  Time added: 9:40 a.m.
Time rennet added: 10:30 a.m.
Acidity at setting: .20%
Rate rennet used: 3 oz./1000 lb. milk
Amt. rennet used: 30 c.c.
Temperature set: 88° F.
Time cut: 11:15 a.m.
Temp. when cut: 87° F.
Acidity when cut:: 0.12%
Time steam on: 11:30 a.m.
Time steam off: 12:00 noon
Temp. steam off: 110° F.
Time dipped: 1:30 p.m.
Temp. at dipping: 110° F.
Acidity at dipping: 0.145%
Time cooked: 90 min.
Salting—
  Time salted: 1:45 p.m.
  Rate: 2 lb./1000 lbs. milk to curd in vat. Balance dry salting in curing room
Hooping—
  Time hooped: 2:00 p.m.
  Time removed from press: 8:00 a.m. (next day)

*Authorized for publication as paper No. 1291 in the Journal Series of the Pennsylvania Agricultural Experiment Station.

# Ascorbic-Citric Acids Prevent Browning of Cut Fruit

By HERBERT G. LUTHER and G. O. CRAGWALL
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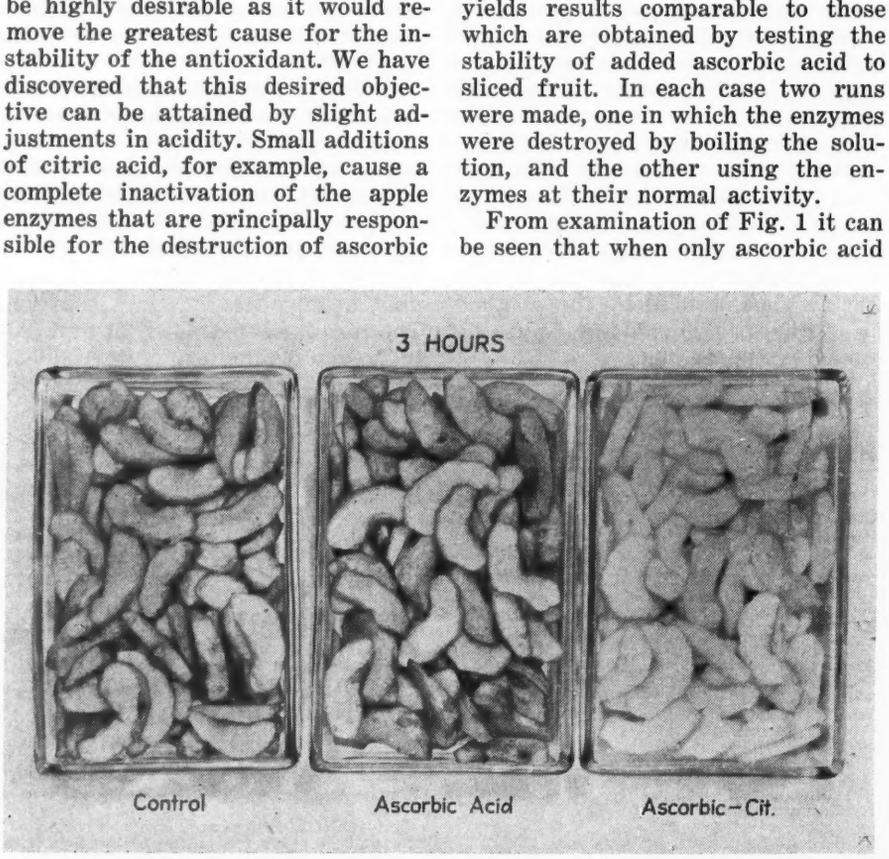
**Anti-oxidant effect of ascorbic acid is destroyed by enzymes in fresh cut fruit, but citric acid can inactivate the enzymes. A combination of citric and ascorbic acids prevents browning better than larger amounts of ascorbic acid used alone and is cheaper**

FROM a study of the mechanism of the destruction of ascorbic acid in cut fruit it is evident that browning and off-flavors result when the natural ascorbic acid, or other naturally occurring antioxidants in the fruit, are destroyed. The enzymes naturally present in the fruit are very efficient in catalyzing this destruction when the surface of the cut fruit is exposed to the air. These enzymes can be destroyed by effective blanching or by cooking of the fruit, but such processing is undesirable in the production of a frozen product or one intended to be served in the raw state.

Any enzyme-inactivating method, which does not have the disadvantages of "cooking" the fruit, would be highly desirable as it would remove the greatest cause for the instability of the antioxidant. We have discovered that this desired objective can be attained by slight adjustments in acidity. Small additions of citric acid, for example, cause a complete inactivation of the apple enzymes that are principally responsible for the destruction of ascorbic acid. This is shown in Fig. 1. These data were obtained by blowing air at a controlled rate through solutions of the active apple juice enzyme system containing added ascorbic acid. The quantities were comparable to those used in commercial applications, namely, 225 mg. per pound of fruit. Tests have established that this method of treating the system yields results comparable to those which are obtained by testing the stability of added ascorbic acid to sliced fruit. In each case two runs were made, one in which the enzymes were destroyed by boiling the solution, and the other using the enzymes at their normal activity.

From examination of Fig. 1 it can be seen that when only ascorbic acid was added to the fruit, the enzymes naturally present destroyed the added ascorbic acid. This was clearly demonstrated by the fact that the fruit with active enzymes required only slightly more than one-half hour to destroy 50 percent of the added ascorbic acid (half-life time),* whereas the same system, with the enzymes destroyed by boiling, took over five hours before 50 percent of the added ascorbic acid was destroyed. When these data are compared with the results obtained by the addition of small quantities of citric acid to the fruit, it is impossible to detect any difference in the retention of added ascorbic acid between the runs where the enzymes were destroyed by boiling and those which retained the natural activity. This clearly shows that by the simple addition of a suitable acid it is possible to completely inactivate the enzymes, which are so largely responsible for the destruction of natural and added ascorbic acid. It is this rapid destruction that has made the use of ascorbic acid impracticable in the treatment of certain fruits, such as apples, where the enzymes are so active that the added ascorbic acid is destroyed in a relatively short time and consequently affords only a very limited measure of protection for the fruit so treated.

It can be seen from Fig. 1 that as




**Sliced apples after 3 hours' exposure to the atmosphere. The light color of the sample, treated with the combined ascorbic-citric acids, indicates that the antioxidants have been retained. Browning occurs shortly after destruction of either natural or added antioxidants.**

*Half-life time is a convenient method of expressing the relative stability of the ascorbic acid. It is the time required for the decomposition of half of the ascorbic acid originally present. Studies have shown that the rate of decomposition is directly proportional to the amount of ascorbic acid present and is independent of concentration; for example, the time required for the ascorbic acid to drop from 200 mg. per lb. to 100 mg. per lb. will be the same as the time required to drop from 100 mg. per lb. to 50 mg. per lb.

more citric acid is added to the fruit, retention of added ascorbic acid is progressively increased. It also indicates that addition of citric acid in concentrations of about 0.5 percent, on the basis of weight of fruit, causes complete inactivation of the enzymes present. This inactivation, at a pH reduction of less than one unit, is indicated by the fact that the half-life time is exactly the same, regardless of whether or not the enzymes were destroyed by boiling prior to the tests.

The half-life time increases as more citric acid is used, the amount that may be added is limited by the nature of the product and the use for which it is intended. In practical tests on the application of citric and ascorbic acids to sliced apples, it was found that 1 percent citric acid imparts a fruit acid taste and is entirely satisfactory for most uses in this product. The more citric or other acid employed, the higher the retention of the added ascorbic acid, and the smaller the quantity required to prevent browning. For example, the addition of from 2 to 4 percent citric acid affords such a high degree of protection that little or no added ascorbic acid is necessary in the prevention of browning. It is desirable, however, to add small quantities of ascorbic acid to give a further degree of protection.

The quantity of citric or other fruit acid employed and the amount of ascorbic acid required under these conditions will be determined largely by the product and its use. In Fig. 2 is shown the fate of ascorbic acid when added in one-fifth of the quantity usually employed in commercial applications. It can be seen that the results at this reduced level are comparable to those obtained when tests were run at a higher level, and that when no citric acid was used, the added ascorbic acid was destroyed in a matter of minutes. When it was used in conjunction with citric acid, about 16 hours of exposure to air at room temperature was required before half of the added ascorbic acid was destroyed.

In practical tests on cut apples, at this reduced level of ascorbic acid, good color retention was obtained when citric acid was used. The light color is related to the antioxidants because browning occurs shortly after destruction of either natural or added antioxidants.

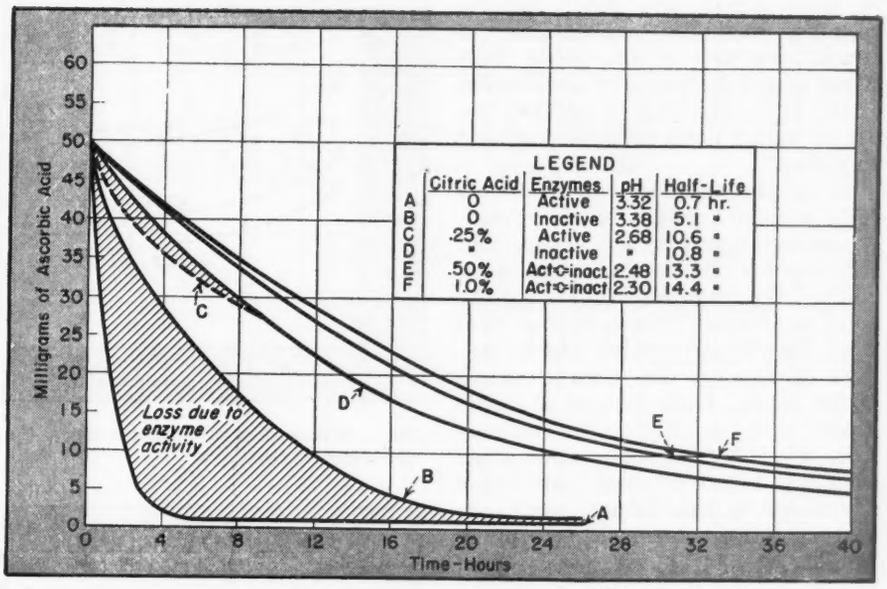

LEGEND
Citric Acid | Enzymes | pH | Half-Life
A 0 | Active | 3.32 | 0.7 hr.
B 0 | Inactive | 3.38 | 5.1 "
C .25% | Active | 2.68 | 10.6 "
D " | Inactive | " | 10.8 "
E .50% | Act⇔inact | 2.48 | 13.3 "
F 1.0% | Act⇔inact | 2.30 | 14.4 "
Loss due to enzyme activity
Milligrams of Ascorbic Acid
Time-Hours

FIG. 1. Effect of citric acid on apple enzymes and ascorbic acid.

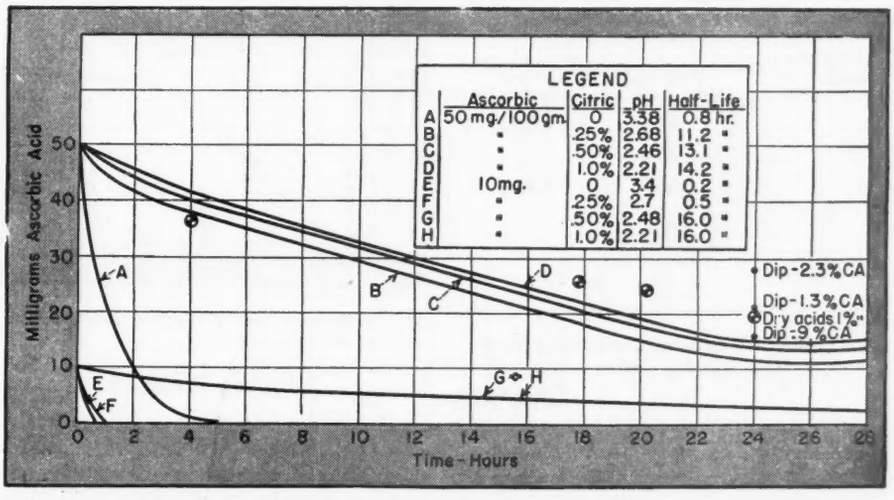

LEGEND
Ascorbic | Citric | pH | Half-Life
A 50 mg./100 gm. | 0 | 3.38 | 0.8 hr.
B " | .25% | 2.68 | 11.2 "
C " | .50% | 2.46 | 13.1 "
D " | 1.0% | 2.21 | 14.2 "
E 10mg. | 0 | 3.4 | 0.2 "
F " | .25% | 2.7 | 0.5 "
G " | .50% | 2.48 | 16.0 "
H " | 1.0% | 2.21 | 16.0 "
Dip-2.3%CA
Dip-1.3%CA
Dry acids 1%
Dip-.9%CA
Milligrams Ascorbic Acid
Time-Hours

FIG. 2. Citric acid stabilizes ascorbic acid in apple enzyme system.

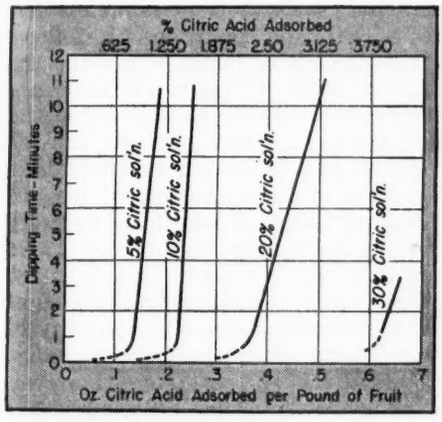

% Citric Acid Adsorbed
625 1250 1875 2.50 3125 3750
5% Citric sol'n.
10% Citric sol'n.
20% Citric sol'n.
30% Citric sol'n.
Dipping Time-Minutes
Oz. Citric Acid Adsorbed per Pound of Fruit

FIG. 3. Adsorption of citric acid by sliced apples in dipping processes.

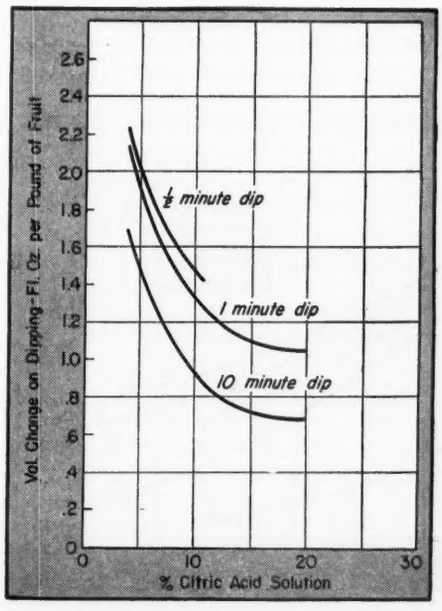



FIG. 4. Adsorption of citric acid by sliced apples in dipping processes.

## Application

Citric and ascorbic acids can be applied to the fruit in a number of ways. In commercial practice, the choice will probably be determined

by plant layout and other factors. Dipping methods, applications in sirups, the use of the acids with sugar in the dry state or application of the dry acids with or without the use of sugar have been successfully employed.

It may be possible to pack frozen fruit with no sugar, or with a greatly reduced quantity of sugar, and still have a non-browning product, adding the required sugar at the point of further processing or final use. This treatment has the advantage of keeping the natural juices bound in the fruit instead of being drawn into the sirup by osmotic action, as is usually the case when even dry sugar is used. An added advantage is that the reduced sugar content also decreases shipping weight.

**TABLE I—Adsorption of Citric Acid by Dipping Methods**

Sliced apples—¼-in. slices

| Strength citric acid bath (percent) | Dipping time (min.) | Citric adsorbed by fruit (percent) |
|---|---|---|
| 5 | ½ | 0.80 |
| .. | 1 | 0.88 |
| .. | 5 | 1.03 |
| .. | 10 | 1.13 |
| 10 | ½ | 1.37 |
| .. | 1 | 1.40 |
| .. | 5 | 1.46 |
| .. | 10 | 1.53 |
| 20 | 1 | 2.35 |
| 30 | 1 | 3.90 |

**TABLE II—Make-up Composition for Dipping Baths**

| Citric solution (percent) | Dipping time (min.) | Citric acid oz. per 100 lb. fruit | Fluid ounce citric acid solution per 100 lb. fruit |
|---|---|---|---|
| 5 | ½ | 13.1 | 199 |
| .. | 1 | 14.1 | 184 |
| .. | 10 | 17.9 | 153 |
| 10 | ½ | 22.0 | 145 |
| .. | 1 | 22.6 | 129 |
| .. | 10 | 24.4 | 92 |
| 20 | 1 | 37.4 | 107 |
| .. | 5 | 43.2 | 92 |
| .. | 10 | 49.5 | 69 |

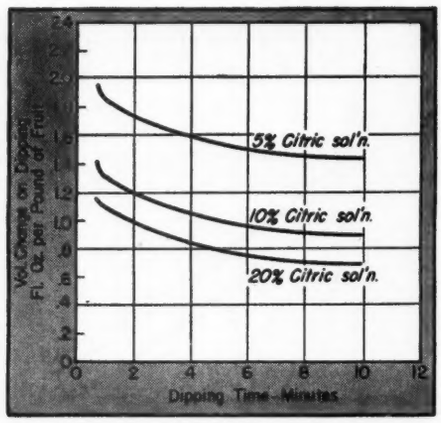



**FIG. 5. Volume loss of dipping solution. (¼-inch sliced apples.)**

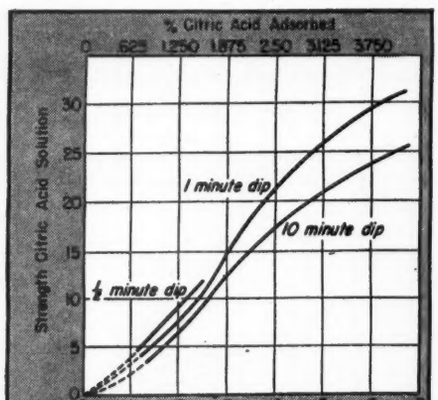

% Citric Acid Adsorbed
Strength Citric Acid Solution
1 minute dip
10 minute dip
½ minute dip
Oz. Citric Acid Adsorbed per Pound of Fruit

**FIG. 6. Volume loss of dipping solution. (¼-inch sliced apples.)**

## Dipping Methods

It may be desirable to immerse the cut fruit in a solution of citric acid. Figs. 3 and 4 show by disappearance data the amount of citric acid that is adsorbed upon cut apples when dipped in different strength acid solutions for various times. The quantity of acid adsorbed is mainly determined by the strength of the solution and the time of dipping. Table I, taken from Figs. 3 and 4, shows the quantity of acid adsorbed in the case of dipping sliced fresh apples.

The net volume of change was considerably decreased when stronger concentrations of acid were used, the effect being slightly more pronounced for longer dipping times. These relationships are shown in Figs. 5 and 6. Apparently the stronger acids caused a diffusion of the natural juices of the fruit into the concentrated dipping bath and account for the smaller volume change for these solutions. It can be seen that the volume change of the dipping solution is predominantly determined by the strength of the acid solution, but in each case longer dipping times also decreased the volume change. It seems probable that longer dipping time allowed the change to proceed further towards the establishment of equilibrium conditions. It follows that dipping methods, employing the less concentrated acid solutions, are more desirable as they produce the minimum amount of osmosis and the maximum retention of natural juices.

From a consideration of loss of dipping solution, based on viscosity of the citric acid solution, one would expect the reverse effect, namely, higher bath volume losses at stronger acid concentrations. The viscosity of citric acid solutions does not change markedly over this range, however, and evidently osmotic action is the determining factor.

From disappearance data and from volume changes, Table II shows the quantity of make-up liquid required and its concentration. These data have been obtained by tests on

(*Turn to page* 208)

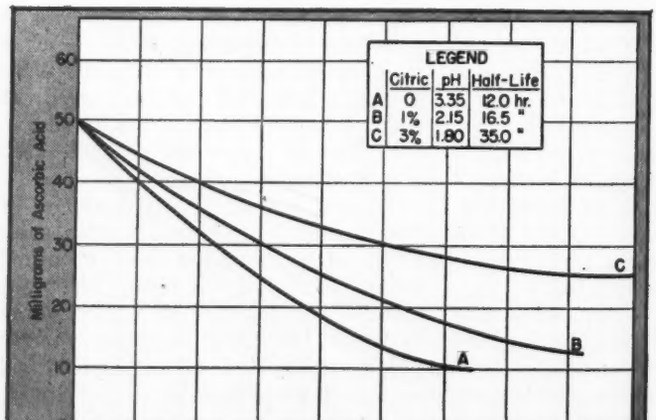



**FIG. 7. Destruction of l-ascorbic acid in invert sugar sirup. 400 cc. of air per minute.**

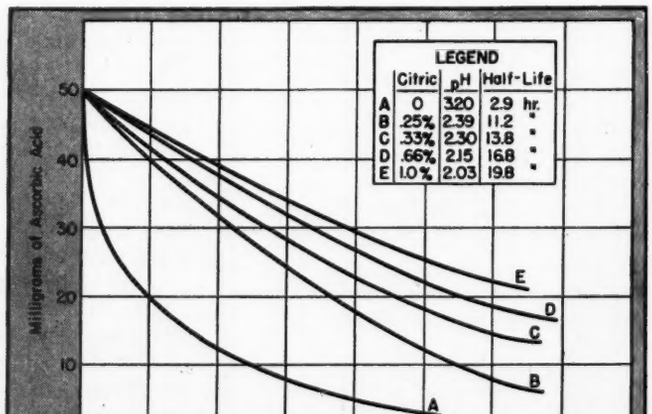

LEGEND
Citric | pH | Half-Life
A 0 | 3.20 | 2.9 hr.
B .25% | 2.39 | 11.2 "
C .33% | 2.30 | 13.8 "
D .66% | 2.15 | 16.8 "
E 1.0% | 2.03 | 19.8 "
Milligrams of Ascorbic Acid
Time-Hours

**FIG. 8. Effect of citric acid in retarding the destruction of l-ascorbic acid in water solutions. 400 cc. of air per minute.**

# OIL ANALYSIS Spots Engine Faults

**Service makes periodic examination of oil as an economical means of pointing up the motor parts that need adjustment or repair before they can cause serious damage. Here is how the service works with an average fleet**

AN inexpensive oil analyzing service for checking the condition of truck engines and the possible need for adjustment and repair is at the disposal of food fleet superintendents. The analysis is done on much the same principle that prompts the medical doctor to test the blood of a patient to help determine his ailments. The engine is the heart of the motor truck and the lubricating oil its blood stream.

Just as the condition of one's blood stream cannot be determined merely by looking at the blood, neither can the condition of an engine's lubricating oil be told by looking at it, smelling it, or rubbing it between one's fingers. Hence, the need for some reliable and inexpensive analysis.

Lubricating oil is the truck engine's blood stream because it provides that infinitesimally thin film between the engine's moving metal parts. If this film is impaired or destroyed, metal to metal contact results. This, in turn, causes excessive heat and a rapid wear of those parts. Such wear impairs the efficiency of the engine and necessitates repairs.

### Contamination

The ability of engine oil to provide that essential lubricating film between the moving metal parts may be impaired both by dilution of the oil and by the presence of foreign solid substances in the oil. While slight dilution and traces of foreign solids do not impair the oil's lubricating qualities, excessive amounts indicate the necessity for adjustments or repairs and the replacement of the contaminated oil.

It is therefore apparent that the oil analysis by itself is not enough. To be effective, it must be interpreted to tell the mechanic what adjustments or repairs to make and whether or not to drain the old oil and replace it with new. With this information, the work of the mechanics may be most efficiently directed to those engines that need it most.

The receipt of the oil analysis and its interpretation by the maintenance superintendent, however, are still not enough to enable him to fit them into his maintenance system as a means of reducing fuel, oil and repair costs. Additional services, not furnished by the usual chemical laboratory, must be provided. These include means for taking the samples easily and getting them to the testing laboratory quickly and cheaply.

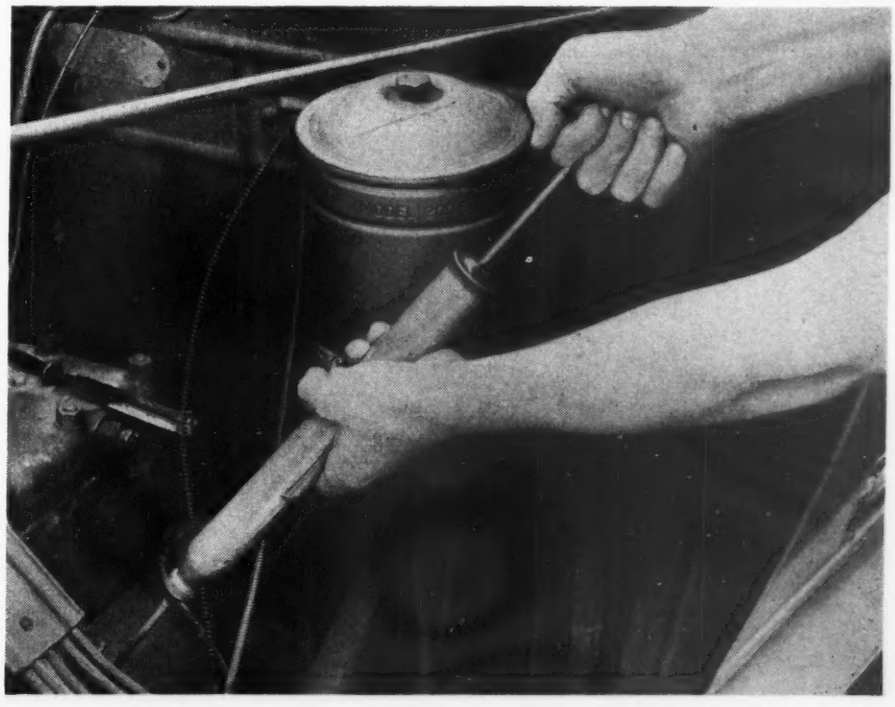
Finally, the analysis and its directives must be returned promptly, so that any adjustments or repairs indicated can be made before the trouble results in more expensive repairs.

The oil analysis itself must be in such non-technical form that persons other than chemical engineers can understand it. The interpretations drawn must be based not on theory, but on the widest possible experience in the use of lubricating oil in all makes and sizes of automotive equipment, operating under all conditions.

### Complete Records

Further, the oil analyses must be furnished in sufficient copies to provide a follow-through control by the executive, maintenance superintendent, shop foreman and mechanic. They must also be in such form that a chronological record of the reports can be built up for easy reference over the entire life of each engine.

All of the above requirements are fully met by the engine oil analysis



**The oil samples are easily and quickly taken direct from the engine's crankcase by a special syringe inserted through the oil gage. The syringe is furnished by the aanalyzing laboratory.**

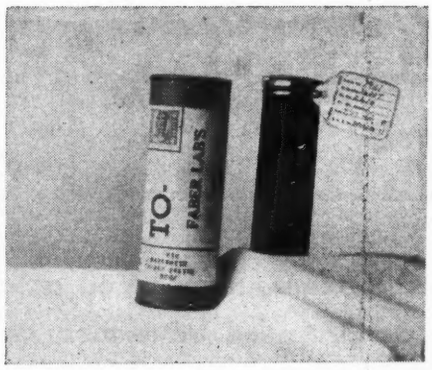
service offered by Faber Laboratories with offices and testing laboratories in New York City, Chicago, Los Angeles, San Francisco and Seattle. The Faber company supplies for each shop, from which oil samples are to be taken, a special sampling syringe and an adequate supply of empty 4-oz. sample bottles and self-addressed mailing containers.

### Simple Operation

In the principal cities where Faber laboratories are located and where the number of analyses made is large, the containers with the oil samples are picked up without charge, at pre-arranged times, by a Faber route truck. At other points, the samples are mailed to the nearest Faber laboratory, with the postage prepaid by the Faber company.

The samples are tested immediately and the oil analyses and their interpretations, in as many copies as desired, are returned within three days after date of receipt. At the same time, a supply of empty bottles and containers, each with a pre-addressed label inside, is returned for taking the next samples. The Faber company makes a charge of $1.50 for each sampling syringe and an initial deposit charge of 25 cents each for mailing containers. Damaged containers are replaced without charge.

Experience has proved that for local deliveries of food products, such as milk, bread, meats, groceries, fruits and vegetables, oil analyses made on the 60-30 day basis are adequate. This means that at least once in every 60 days, the Faber service will analyze the oil from each engine in the fleet and, that in addition, each 30 days thereafter they will make recheck analyses on the oil from those engines for which remedial action was indicated.




**The oil sample in the 4-oz. bottle, at right, is placed in the container, at left, to be mailed to, or picked up by, the laboratory.**

### Charges Small

For the above service, the Faber charge is $1.18 per vehicle per month. For convenience, a flat monthly charge is obtained by multiplying the number of engines in the fleet by $1.18. The truck owner supplies a list every three to six months and the monthly charges are computed accordingly.

On the above basis, the yearly service charge per vehicle is $1.18 times 12 or $14.16. Based on an average daily route mileage of 50 for a 300-day year, the yearly truck mileage is 15,000. Reduced to a cost per mile, the Faber oil analysis cost is less than one-tenth of a cent, certainly not a prohibitive cost.

On food field trucks or tractors operating on much longer hauls, a more frequent Faber service is available on a 30-15 day basis. The procedure is the same as that outlined above except that the oil in every engine is tested once each month with rechecks every 15 days on those engines where remedial action has been indicated. The charge for this more frequent service is $2.36 per truck per month or arrangements can be made for testing each fast-moving truck once each month for a flat monthly rate.

The Faber service is also available on automotive diesel engines at the same cost as for gasoline engines and on those engines operated on Butane fuels. For a charge of $21 each, tests are also provided on oils drawn from automotive gearboxes, transmissions and differential cases with a special syringe. Such tests determine the effect the operation has had upon the oil and indicate the amount and kind of abrasive wear and the formation of any other contaminants.

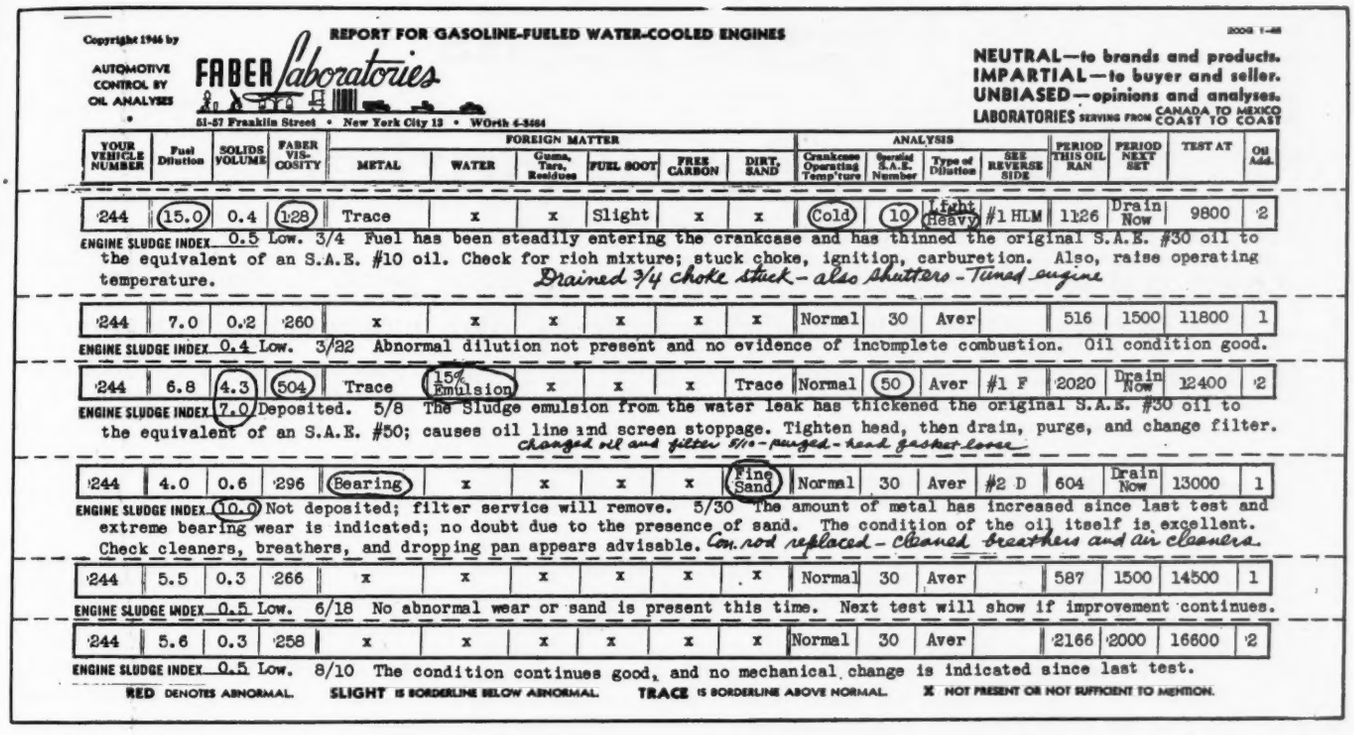
### Interpretations

The Faber reports mailed to the maintenance superintendent indicate engines that are sludged, ones that are becoming sludged, adjustments that are needed and accessories that are not functioning properly. In addition, the degree and cause of the condition are indicated and the kind of remedial action suggested, irrespective of the age, make or type of engine or the kind of work in which it is used.

The ability of the Faber Laboratories to know what is normal for engine lubricating oil conditions and to state the required remedial action is based upon the testing of approximately 2,000,000 samples since the formation of the company in 1928. These were from all kinds of engines, in all kinds of work, in all seasons and from every locality in the United States.

The accumulated experience from such a tremendous number of tests has indicated how much and what kind of metal may be found in an engine before abnormal wear occurs; how much fuel soot and fuel dilution is allowable before an adjustment is needed; and, what amount of water emulsion, carbon, sand, abrasives and gums may be present before actual harm is caused. In addition, a Faber engine sludge index has been developed, through a new use of chemicals which coagulate and then isolate the potential sludge-forming products. This index has shown that

**Experience has taught the laboratory technicians how to interpret their analyses of the contaminated oil, as well as how to present their findings in terms clear to the mechanic.**



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REPORT FOR GASOLINE-FUELED WATER-COOLED ENGINES

FABER Laboratories

51-57 Franklin Street • New York City 13 • WOrth 4-3464

NEUTRAL—to brands and products.
IMPARTIAL—to buyer and seller.
UNBIASED—opinions and analyses.
LABORATORIES SERVING FROM CANADA TO MEXICO COAST TO COAST

| YOUR VEHICLE NUMBER | Fuel Dilution | SOLIDS VOLUME | FABER VISCOSITY | FOREIGN MATTER: METAL | WATER | Gums, Tars, Residues | FUEL SOOT | FREE CARBON | DIRT, SAND | ANALYSIS: Crankcase Operating Temp'ture | Special S.A.E. Number | Type of Dilution | SEE REVERSE SIDE | PERIOD THIS OIL RAN | PERIOD NEXT SET | TEST AT | Oil Add. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 244 | (15.0) | 0.4 | (128) | Trace | x | x | Slight | x | x | (Cold) | (10) | Light (Heavy) | #1 HLM | 1126 | Drain Now | 9800 | 2 |

ENGINE SLUDGE INDEX 0.5 Low. 3/4 Fuel has been steadily entering the crankcase and has thinned the original S.A.E. #30 oil to the equivalent of an S.A.E. #10 oil. Check for rich mixture; stuck choke, ignition, carburetion. Also, raise operating temperature. Drained 3/4 choke stuck - also shutters - Tuned engine

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 244 | 7.0 | 0.2 | 260 | x | x | x | x | x | x | Normal | 30 | Aver | | 516 | 1500 | 11800 | 1 |

ENGINE SLUDGE INDEX 0.4 Low. 3/32 Abnormal dilution not present and no evidence of incomplete combustion. Oil condition good.

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 244 | 6.8 | (4.3) | (504) | Trace | (15% Emulsion) | x | x | x | Trace | Normal | (50) | Aver | #1 F | 2020 | Drain Now | 12400 | 2 |

ENGINE SLUDGE INDEX (7.0) Deposited. 5/8 The Sludge emulsion from the water leak has thickened the original S.A.E. #30 oil to the equivalent of an S.A.E. #50; causes oil line and screen stoppage. Tighten head, then drain, purge, and change filter. changed oil and filter 5/10 - purged - head gasket loose

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 244 | 4.0 | 0.6 | 296 | (Bearing) | x | x | x | x | (Fine Sand) | Normal | 30 | Aver | #2 D | 604 | Drain Now | 13000 | 1 |

ENGINE SLUDGE INDEX (10.0) Not deposited; filter service will remove. 5/30 The amount of metal has increased since last test and extreme bearing wear is indicated; no doubt due to the presence of sand. The condition of the oil itself is excellent. Check cleaners, breathers, and dropping pan appears advisable. Con. rod replaced - cleaned breathers and air cleaners.

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 244 | 5.5 | 0.3 | 266 | x | x | x | x | x | x | Normal | 30 | Aver | | 587 | 1500 | 14500 | 1 |

ENGINE SLUDGE INDEX 0.5 Low. 6/18 No abnormal wear or sand is present this time. Next test will show if improvement continues.

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 244 | 5.6 | 0.3 | 258 | x | x | x | x | x | x | Normal | 30 | Aver | | 2166 | 2000 | 16600 | 2 |

ENGINE SLUDGE INDEX 0.5 Low. 8/10 The condition continues good, and no mechanical change is indicated since last test.

RED DENOTES ABNORMAL. SLIGHT IS BORDERLINE BELOW ABNORMAL. TRACE IS BORDERLINE ABOVE NORMAL. X NOT PRESENT OR NOT SUFFICIENT TO MENTION.

**Here is the maintenance superintendent's master control sheet showing the condition of the engine in his vehicle No. 244, as revealed by the oil analyses over a period of five months, from March 4 to August 10. On the first analysis, the ringed figures (they are typed in red on the report) show a dangerous dilution. Following the laboratory's advice, the mechanic found that both choke and shutters were stuck. The next analysis shows that trouble corrected, but on May 8, some new trouble appeared but was repaired by June 18.**

there are five stages of sludge, each requiring a different remedial treatment.

### Reports Correlated

A master record sheet is kept in the Faber files for the oil tests of each individual engine for the engine's entire life. Each test, therefore, may be correlated with those made previously. Each test, as shown on the Faber master record, is duplicated on the report furnished to the maintenance superintendent. Reports for six engines are given on one sheet, with horizontal perforations between each report. By tearing apart at the perforations and segregating by vehicle numbers, the maintenance superintendent may make up a master control of his own for each engine by pasting each report, in order, on a loose-leaf page for each vehicle.

Such a master control sheet is shown in the illustration at the top of this page. It gives for each analysis, the test figures on dilution, solids volume, Faber viscosity, foreign matter, and other control factors. It also shows the remedial action to be taken in each case.

Of especial significance is the factor of Faber viscosity, which differs from Saybolt viscosity as used by regular oil laboratories working under the standards of the American Society of Testing Materials. With the Saybolt instrument, designed to test the body or fluidity of new oils, the oil being tested must be heated and strained to prevent orifice clogging.

But oil circulating in an engine becomes thinner due to dilution, or thicker because of foreign matter. If the latter is strained out before the test and heat applied, which may evaporate the fuel dilution and water, as necessary with the Saybolt instrument, the remaining oil is no longer the same as the sample drawn from the crankcase.

### Viscosity Determined

This led to the development of the Faber viscosity instrument, which determines the fluidity of the oil as drawn from the crankcase without the removal of the foreign matter and without direct heat that would cause the loss of the diluent during the test. Thus, a reading is secured of the viscosity of the oil as it actually existed while being used in the engine.

The Faber oil analyses do not eliminate the need for the usual preventive maintenance tools, such as exhaust gas analyzer, ignition indicator, compression and vacuum gauges and timing and valve test equipment. Rather, the oil analyses direct when and where to use such tools and then double-check on the efficiency of the adjustments made with the tools. Often they indicate internal wear and maladjustments before they are evident to either the driver or mechanic.

### Proves Efficient

The oil analyses have definitely proven that when oil is changed without remedying the cause of the oil getting in poor condition, the same poor condition may be expected to recur immediately thereafter, just as if the oil had not been changed at all. This is obviously extremely wasteful of oil. Likewise, it is most inefficient to change oil at one time, and correct the engine faults at another time.

While the purpose of the Faber oil tests is not to lengthen the periods between oil changes, this results when all of the engines have been put in good condition. Until that time, some oil change periods may be shortened and others greatly lengthened.

In addition, savings may be made in the cost of the fleet's regular preventive maintenance by taking the sample of each engine's oil a few days before its inspection is due. When the oil analyses are returned, only those engines requiring attention need be inspected.

# Frozen Foods In The Retail Market

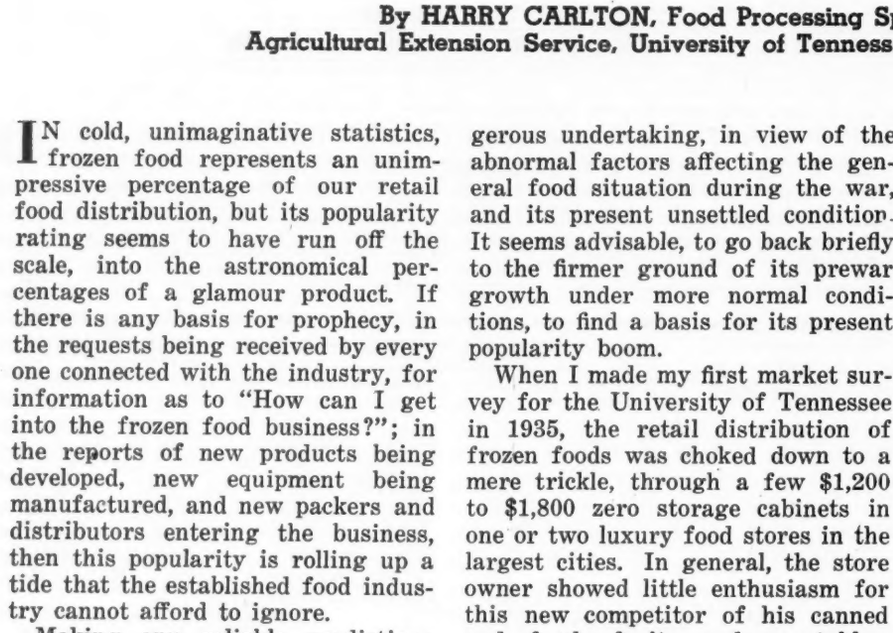
**Frozen food stores, department stores and freezer-locker plants to compete with retail food stores in the distribution of frozen foods. High quality agricultural raw materials, educational, and distribution plant facilities all need to be expanded.**

By HARRY CARLTON, Food Processing Specialist,
Agricultural Extension Service, University of Tennessee, Knoxville, Tenn.

IN cold, unimaginative statistics, frozen food represents an unimpressive percentage of our retail food distribution, but its popularity rating seems to have run off the scale, into the astronomical percentages of a glamour product. If there is any basis for prophecy, in the requests being received by every one connected with the industry, for information as to "How can I get into the frozen food business?"; in the reports of new products being developed, new equipment being manufactured, and new packers and distributors entering the business, then this popularity is rolling up a tide that the established food industry cannot afford to ignore.

Making any reliable predictions regarding the prospective retail distribution of frozen foods is a dangerous undertaking, in view of the abnormal factors affecting the general food situation during the war, and its present unsettled condition. It seems advisable, to go back briefly to the firmer ground of its prewar growth under more normal conditions, to find a basis for its present popularity boom.

When I made my first market survey for the University of Tennessee in 1935, the retail distribution of frozen foods was choked down to a mere trickle, through a few $1,200 to $1,800 zero storage cabinets in one or two luxury food stores in the largest cities. In general, the store owner showed little enthusiasm for this new competitor of his canned and fresh fruits and vegetables. Frozen packed meats were not yet in the picture.




**A typical frozen food store. Shelves and fresh vegetable counters have been superseded by white enamel, open top, self-service cabinets.**

Two years later another and more comprehensive survey, of both production and marketing, found a slow penetration of less elaborate $200 to $500 cabinets into grocery and other retail food stores. The grocer sometimes confessed he had been forced to carry frozen foods by the demands of his customers who had become acquainted with the new product through friends, or even on visits to other cities. Realization that the ice cream cabinets afforded practical, if not ideal, storage facilities was adding slightly to the number of outlets, and materially to the consumer education process.

In the Northwest, the pioneer freezer-locker plants were offering the first hope of economical distribution of frozen foods to rural and small town consumers. Their sales promotional value for commercial frozen foods is not yet fully appreciated.

On the production front, the big food processors—the canners and the meat packers—did not admit any viewing with alarm of this revolutionary young upstart in the food industry.

Progress, up until the war froze the production of holding cabinets, was steady but not spectacular. Even Birds Eye's steadily increasing retail distribution system, and volume of sales, scarcely justified the limited national advertising they did before Pearl Harbor.

### Dealers Indifferent

Here was an attractive and convenient product which could be produced in quantity production at practically the same cost as canned goods, facing: (1) The indifference of our established food industries—if not their positive opposition, and (2) the necessity of revolutionary

changes in our food distribution channels, involving expensive re-equipment all along the line. As a consequence, prewar retail distribution was choked down to such limited production as could be stored in a few zero storage warehouses in large cities and distributed through some 30,000 often neglected and grimy, white enameled cabinets in as many retail stores!

### Consumers Demand

On the positive side of the picture was the growing, insistent consumer demand; the persistence of one large packing and distributing concern, which had an expenditure of millions to justify and recoup; and the entrance into the industry of the many small and a few large packers and distributors of the pioneer type.

When they found expansion blocked in the retail field, these new packers took the path of least resistance—into the institutional and remanufacture markets. The eager acceptance by these outlets encouraged the development in agricultural areas of small but expanding packing plants; first to freeze surplus products and later to encourage planned farm production of raw material suitable for preservation by freezing.

To these packing plants and their sources of agricultural production, retail distribution will have to look for any substantial increase in the 1946 volume of retail packaged frozen fruits and vegetables over that which can be produced by the established prewar retail packers. Expansion of frozen food facilities during the war was limited to meeting the requirements of the armed forces. There has been little available equipment since, and slowness in starting its manufacture has left no time for any extensive enlargement of plant facilities and, perhaps more important, for promoting agricultural production for freezing.

### Information Requested

Up until the last twelve to fifteen months, the requests for information were mainly questions of production: plant layout, equipment, methods of freezing and handling, and how to secure markets. Recently there has been an interesting shift in the type of information requested. At the present time the majority of requests deal with distribution and merchandising and show a particular interest in distribution to the home. The general impression seems to be that, in the main, the processing problems have been solved.

**Frozen foods, in open, eye appealing display cases within easy reach of the customer without bending or stooping. The space under the display case is utilized for storage of frozen foods.**

Many of the returned veterans, who are in the majority among those calling at my office or writing for information, have in mind building freezer-locker plants in their home towns or opening up smart specialty stores. Some of them contemplate selling home storage cabinets in connection with these stores or locker plants, and even go so far as to consider keeping the cabinets stocked with frozen food by regular house to house deliveries. Questions regarding investment in frozen food companies also come up. Even the food packers and distributors are not immune to calls for information. The number and variety of questions asked indicated the desirability of making at least a general study of the present status of the industry.

The war years have been an incubation period for new equipment, new products, and better distribution methods, as well as consumer acceptance. In spite of the many lapses in quality, for the most part caused by war conditions, popular demand seems to have increased enormously. Manufacturers of war materiel, in their search for postwar products, have not overlooked this new form of food preservation and distribution.

The manufacturers of home storage cabinets seem to lead the field in active faith in the future. We find estimates of 200 to 300 manufacturers bringing out zero storage cabinets for the home, and one estimate that production will reach 10,000,000 cabinets! Since this would necessitate selling a cabinet to one out of every three families in the country, it would seem to be an over-ambitious program. This is especially true when it is considered that the household refrigerator manufacturers are including a frozen food storage compartment in practically all their units. The installation of lockers in apartment houses is a logical solution of lack of space in the small city kitchen and such installations are being made.

### Locker Plants

Contrary to early predictions, the rural districts are leading the cities in the appreciation and use of frozen foods, especially meats. An estimated 6,500 freezer-locker plants—and their number is increasing as fast as building materials and equipment become available—serve well over 2,000,000 families. They are educating not only the locker renters, but their friends and neighbors, in the advantages of frozen foods. The yearly capacity of these plants represents at least 1,000,000,000 pounds.

(*Turn to page* 214)

# New Market for American Food

National Capitol, Havana, Cuba.
Along with all the Latin American countries, this Island Republic of 5,000,000 inhabitants, is a potential market for American foodstuffs.

**Untold possibilities are awaiting the manufacturer of foodstuffs who will initiate an active educational and marketing program to expand the Latin American market. The buying power of Cuba alone, riding on a sugar boom, has never been higher**

By RAFAEL LAMARCHE V, Havana, Cuba

CUBA and all the Latin American countries have long depended on the American food market for a large percentage of their bulk food supply. The American manufacturer and exporter are well aware of this but may be overlooking another factor that would greatly increase their markets in these countries. That factor is in the shipment of prepared and ready-to-serve foods. As an example, I shall describe the situation in Cuba, which is typical of all of the Latin American countries.

Practically 75 percent of the food products consumed in this country are imported from the United States but consist mostly of bulk items such as flour, rice and lard. Our yearly imports of wheat flour total approximately 300,000,000 lb. per year. Rice, amounts to 600,000,000 lb. per year.

Prepared and ready-to-serve foods, however, have not reached the Cuban market to any great extent. These foods are rapidly gaining popularity in Cuba but are difficult to obtain. In Havana, a city of nearly 1,000,000, there are only two American-style grocery stores carrying a complete stock of American goods.

There can be no doubt that now is the opportune time to introduce these prepared food products. Some time ago, an enterprising firm introduced a dehydrated soup to the people. Every corner grocery store in Havana displayed beautifully decorated cellophane envelopes, announcing in bright green letters, a "Delicious Continental Soup." Since then, hundreds of thousands of these "soup envelopes" have been sold.

It is true that there is more to cultivating this market than merely shipping these foods for consumption. The people must be taught the advantages of changing their eating habits. Undernourishment is one of the most serious problems in these countries. While epicurean in their leanings and habits, the dietetic system of these people is very deficient and unbalanced. The causes for this are obvious: dietetic habits handed down from Colonial times when most food products had to be brought in from distant lands. Rice, beans and other bulky food that make up the daily menu of most of the people were the only items that could be carried with safety on the old vessels. These ships, making a trip from Spain, with no refrigerating facilities, often took three months to reach port. A well-known Spanish

proverb says, "Habit becomes second nature." The continued large consumption of these bulky foods bears out the wisdom of this proverb. The lower classes of Cuba live principally on a diet of rice, red or pinto beans, fresh beef (when available) and a variety of roots that bear some similarity to the potato. Most of these are starchy foods containing very little, if any, mineral salts.

Fresh food products are not plentiful. All farmers center their whole attention on the raising and production of "money crops" such as cane sugar, tobacco and coffee. As a result, the growing of the necessary products for their own feeding is pitifully neglected. Foreigners are astounded at the sight of a Cuban farmer who owns thousands of acres of land planted with sugar cane, riding several miles to town to buy onions imported from Chile, lard packed in Chicago, and other imported items. All wheat flour is also imported from the United States.

### Diet Affects Health

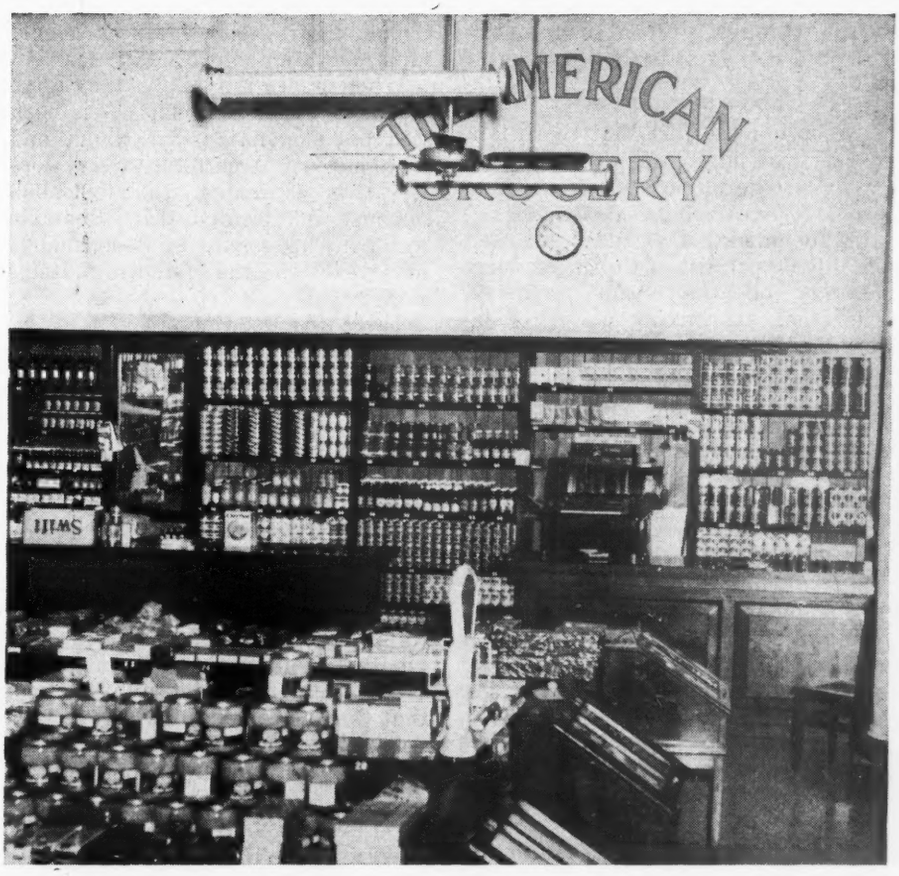
From this picture it is easy to see that the Cuban's diet is very deficient in mineral salts and fats, although they tax their stomachs to the limit with volume, in starchy foods. Fresh beef, eaten without sufficient previous refrigeration, fully completes this picture of deficient nutrition.

Liver and kidney troubles, rheumatism, colds, catarrh are endemical in Cuba. As a result of this, Cuba is a veritable paradise for medical laboratories of all kinds. Proof of this can be verified by examining the export lists of many American pharmaceutical firms. Or, come to Havana and see the size, number and volume of business done by the domestic medicinal laboratories.

Years ago, a French perfumist called at my father's store and was astounded at the amount of perfume imported into Cuba and asked, "Do you Cubans bathe in perfume?" Today we might ask, "Do Cubans feed on medicine?" insofar as medicine consumption in Cuba is concerned.

If the Cubans would invest as much money in good, well-balanced and healthful food as they now invest in medicines, there is no doubt but that they would be the best fed people in the world.

American food manufacturers would do well to study this phase of the market. They would realize the tremendous buying power of the people. With a proper approach they could convince these people that




**One of the two American-style grocery stores in Havana, a city of nearly 1,000,000. These are practically the only stores now carrying a complete stock of American goods, although there are over 3,000 additional stores owned by Spaniards, Chinese and Cubans. Tinned, dehydrated and ready-to-serve foods are gaining in popularity but remain scarce items.**

**A typical Cuban "Corner Grocery Store." These are owned by Spaniards and a few Cubans. Bulk foods, such as flour, rice and lard, have long been imported from the United States. Prepared and ready-to-serve foods, however, which the Cuban people have been accepting with enthusiasm, remain scarce. Note bar for dispensing alcoholic beverages at the counter.**

health through proper food and a balanced diet is available to them.

### Cuba's Buying Power

Accepting the fact that there is a market, you might ask, and justly so, "What is the buying power of these people?" and demand facts and figures to indicate a profitable market.

Fully 90 percent of Cuban economy depends on the sugar industry. Therefore, its buying power is determined by the yield, production and price of the sugar crop. With sugar at a premium in all parts of the world, buying power of Cuba is now at its best.

The alcohol and liquor industry, both of which are dependent on the sugar industry for their raw product —molasses—experienced very rapid gains during the war but are now returning to normal.

Manufacturers of hard candies and preserves also experienced great progress during the war but are now almost at a standstill. These industries should be considered logical ones inasmuch as the raw products—sugars and fruits—are all native products. It would seem a wise policy for the American manufacturers of foodstuffs to assist in furthering this industry in Cuba and thus build up greater buying power for other American food products.

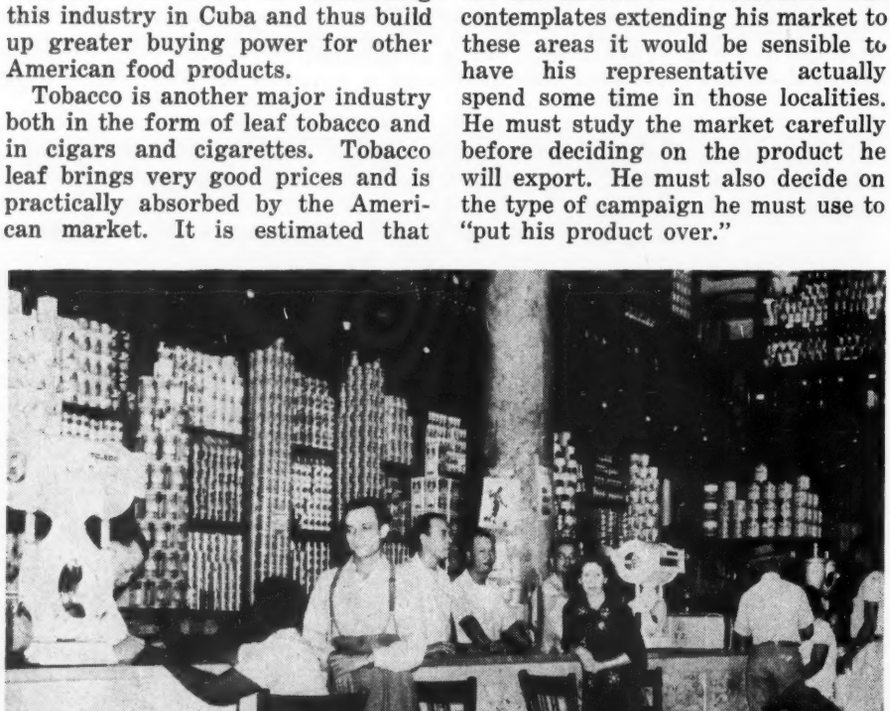
Tobacco is another major industry both in the form of leaf tobacco and in cigars and cigarettes. Tobacco leaf brings very good prices and is practically absorbed by the American market. It is estimated that Cuban cigars soon again will hold supremacy in the European market.

When money is available the Cuban spends it freely. It has often been said his slogan is "Eat, drink and make merry." According to very conservative estimates, the 5,000,000 Cubans inhabiting this Republic spend an aggregate of $300,000,000 per year on the following items alone:

| | |
|---|---|
| Tobacco (cigars, cigarettes) | $ 75,000,000 |
| Alcoholic beverages (rum, beer, liquors) | 75,000,000 |
| Lottery tickets and other gambling | 150,000,000 |

### Cuban Food Taste

As previously stated, the Cuban must be taught to relish and appreciate American foods. It is a well-known fact that through custom and use, some foods are most enjoyable to people in certain localities but are disliked by others in different places. I could give you some of the foods that Cubans relish but which to your American palate would taste like a piece of hot laundry soap. Palates differ not only with different countries and different climates, but even among the Latins themselves. For the manufacturer of foodstuffs who contemplates extending his market to these areas it would be sensible to have his representative actually spend some time in those localities. He must study the market carefully before deciding on the product he will export. He must also decide on the type of campaign he must use to "put his product over."



**This is one of the large and popular Chinese grocery stores in Havana. Unlike the Cuban and Spanish stores, they do not have a bar for dispensing alcoholic drinks to the public.**

### Stores in Cuba

Cubans buy their food requirements from the "bodegas" (corner grocery store), the "carnicero" (butcher), and from the "viandero," or the man who sells fresh vegetables and roots. These stores are mostly operated by Chinese, Spaniards and a few Cubans. It is estimated that there are approximately 3,000 grocery stores in Havana.

The Cuban and Spanish grocery stores have a very interesting feature which will no doubt awaken the American's interest, is the fact that 90 percent of them have a small bar at one end of the counter where they dispense alcoholic drinks to the public at a very nominal price. Drunkenness, however, is very rare.

### Packaging Food for Cuba

At present, most packaged foods imported to Cuba are sold in their original domestic wrappers. The better classes are familiar with the best-known brands of foods. It has been found that local names, associated with local history and religious creeds, work wonders in the way of permanently establishing a brand in this market. Another reason for the lack of knowledge of the American brands by the lower class has been their inability to buy these products because of the prohibitive price. This is a subject that deserves careful investigation and consideration by the manufacturer.

Weights and sizes should be printed on the packaged food in Spanish and in the metric system, officially used in Cuba. It has been found that in canned food the smaller sizes are most popular.

### Summary

From the foregoing it is evident that there is an excellent opportunity for increasing American food consumption in Cuba and all the Latin countries. An informative and educational campaign and an attractive marketing program, however, must be a part of any plan to increase this market. If properly done, it will result in securing a yearly export trade of tremendous value in foodstuffs to the Latin American countries.

In addition to the financial gains to be realized, this expansion would raise the standards of living of the people of these countries. Moreover, the closer business interchange would bring about a stronger and more lasting bond between the Latins and the Saxons of the Americas.

# EDITORIALS

LAURENCE V. BURTON, Editor

## World Food Troubles

EVERY avenue of publicity has been opened to make the American people conscious of the world famine and to persuade them to share willingly our wholly inadequate food resources. No "drive" within memory has greater merit nor greater impetus. This time, however, it takes more than mere money to keep people alive. A donation of funds, however generous it may be, is not as capable of producing relief of the hungry as self-denial by all of us to conserve food.

The two months ending June 30 will be as critical as any in recent history. If Nature is generous we can be reasonably sure that UNRRA's efforts are not futile. But if Nature is perverse, the outlook will be dire indeed.

Europe's situation, bad as it is, cannot equal India's, where it is predicted that despite all efforts millions will die of starvation in the coming year. Never before has the weather been the determining fate of so many people. The North and South American countries are reducing their reserves of food to dangerously low levels to contribute aid to the food deficit areas.

In view of the potentially dangerous situation one cannot dwell at length upon the manner of conservation of national food stocks. The 80 percent extraction order imposed on flour millers has turned out to be of less value than its proponents had hoped. Even now it is not wholly clear by what calculations the economists and nutritionists had figured it would conserve wheat for export. For stopping the production of patent flours has jumped extraction from about 56 percent to 80 percent. The amount of by-products has been reduced thereby from 44 to 20 percent, nearly all of it animal feeds.

Any gain in human food is thus at the expense of animal feed. Yet, unless there are fewer animals to be fed, there is scant likelihood of a net gain to mankind. Farmers do not starve their own animals for humanitarian reasons. If farm animals are on short rations it is because the farmer lacks pasturage, grain or fodder—not because he wants to save grain for export.

WFO 144, it is now generally conceded, will not make any more wheat available for export than if no action had been taken. It may, however, be the indirect cause of a large reduction in livestock numbers by making mill feeds very scarce. And should the 1946 grain crops in America prove very disappointing, a very considerable reduction in numbers will be desirable.

The April 19 amendments to WFO 144, cutting down flour production to 75 percent of the corresponding 1945 period, will actually save wheat. Yet such troubles as the 80-percent order has created are further aggravated by the reduced volume. The mal-distribution of wheat that has forced many mills to operate intermittently may be partially relieved by the limit of a 21-day inventory of raw material.

Users of flour, commercial bakers as well as housewives, will be forced to reduce consumption to the amounts available, with little likelihood of "extenders" such as were available in World War I.

Any way one looks at the situation, it will not be easy to meet the famine emergency even when it is conceded that the sacrifices are for humanitarian reasons.

There is a world-wide shortage of food. It may last a few months—and it may last much longer. By autumn we shall know the worst, or the best.

## Behind the Merger Scene

APPARENTLY American industry is in another period of mergers reminiscent of the days following World War I. As we have observed them in the food industry there are today two principal reasons behind the formation of larger aggregations of companies. One is the desire to diversify. The other is the desire of many elderly owners of smaller firms to convert their holdings into cash at an easy time.

Both motives are understandable. But an examination of several of the smaller companies' affairs has brought to light an unhealthy condition that has culminated in their absorption by competitors. Though the observation may not apply everywhere, it is nevertheless true in too many instances, that the small companies that were swallowed were high cost producers. Products were good. Reputations were good. But costs were too high to operate at a profit under OPA ceilings today.

Two such firms are a case in point. One had done only a trivial amount of modernizing since 1925. The other had not replaced a single piece of equipment since 1914-1916. Since that time new machine speeds are more than double those of the old reliables of pre-World War I. Yet the late owners could not see the point of junking slow-speed equipment as long as it would still operate. There is now, alas, a new and aggressive parent company. It is ripping out everything and converting it into an up-to-date plant with triple its former capacity. Only the former buildings remain.

In another branch of the food industry a new president of a concern that had not been doing well for years diagnosed its troubles: the production department did not know how to produce fast enough! For years the company had faced vexatious distribution problems, all because its production costs had been a little above, instead of a little below, the average.

To survive in the years to come a food industry must be a low cost producer. This requires constant modernization with the best equipment available. A smart sales department is not half of the story. A smart production department, operating a well-equipped modern plant, can produce at a cost that does not require a high powered sales department in order to make a profit.

It is not easy to modernize a plant quickly today, for deliveries are often greatly delayed. But unless products and production costs can be held at competitive levels, mergers may be the only way out for the firms that are squeezed. Diversification is not the only reason for merging. Diminished profits will cause high cost producers to seek a home. Modernization is the best answer.

## Small Motors Scarce

STRIKES in the electrical manufacturing industry are creating serious problems. Scarcity of fractional horsepower motors and steel chains is holding up completion of many much needed machines. Some makers of packaging machinery are making shipments minus these components where the customers request it. At a later date the missing parts will be forwarded, or the customer may be fortunate enough to be able to supply his own.

Small motors are exceptionally valuable property. Gossip at the Atlantic City Packaging Conference had it that one motor maker had quoted deliveries only for the first quarter of 1948! Only those who had had long business relations with motor builders could hope to get reasonably close deliveries.

## Prepare for Nitrogen Packaging

UP to now the delivered cost of compressed nitrogen has been too high to encourage its commercial use for products of relatively low value such as packaged foods. Most gas packaging, heretofore, has employed carbon dioxide. But nitrogen has several properties not possessed by carbon dioxide. For, though $CO_2$ is loosely regarded as an inert gas, it is in reality a fairly active gas. It is nitrogen that is really inert, but its cost has precluded its extensive use.

There is reason to believe that liquid nitrogen of a high degree of purity will become commercially available in tank-car lots in the reasonably near future.

Smart food manufacturers who have well-equipped packaging laboratories will study the foregoing possibilities. They will have plans ready to utilize pure nitrogen if its cost is sufficiently low. They will also determine what will be the benefits of a change to nitrogen packing in which the package cost item will be balanced against the effect of longer shelf life, diminished sales resistance and lower distribution costs. They also will have ready when opportunity comes a set of specifications not only for the nitrogen-holding package, but also for the nitrogen itself. For the freer the gas must be from residual oxygen, the higher must be its cost. Surely there should be a definite tolerance for every food for the oxygen remaining in the nitrogen used for packing, and in our opinion it will not be necessary for the gas to be absolutely oxygen-free to be of material benefit to the forward looking food manufacturer.

It behooves the food industry to be ready to use it when that time shall come.

## Visitors Are Coming

Now that war restrictions have been lifted and conventions are again being held, visitors will be inspecting our food plants regularly or irregularly. While we may not be too happy about the time that mass visits may take from production schedules, there are definite advantages that come from such outside contacts.

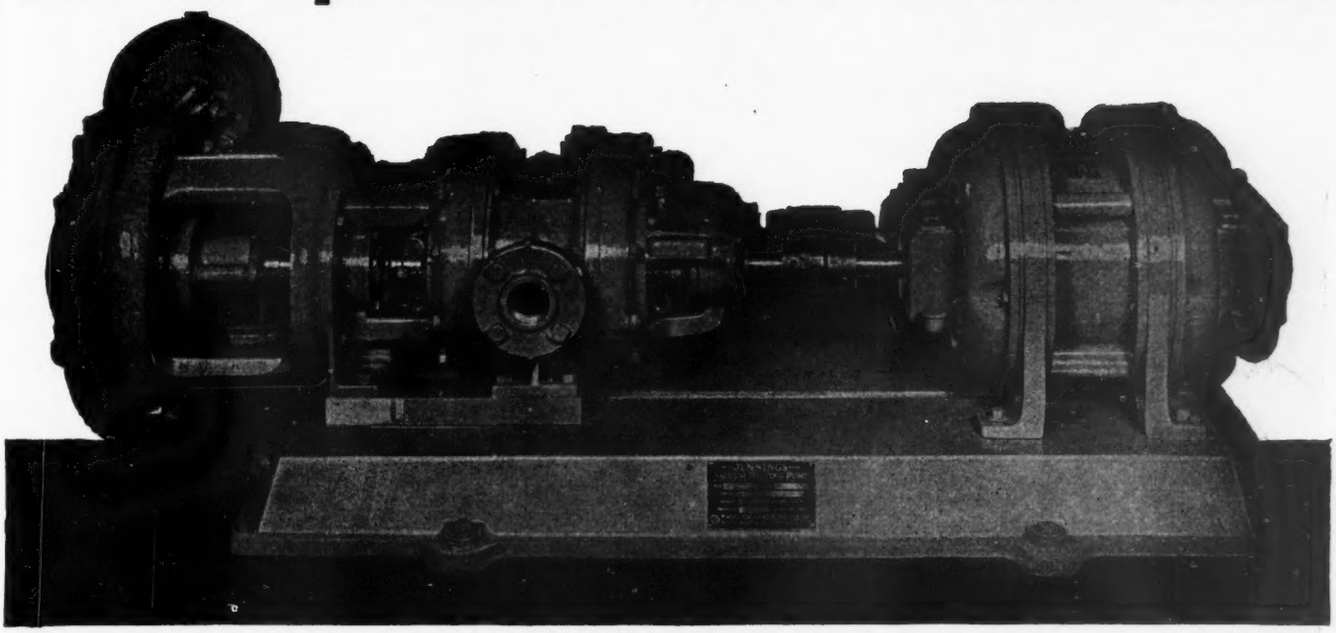
Visitors have, however, a moral right to witness certain responsibilities on the part of the food processors. In this category are found: proper reception of invited visitors, adequate guarding of hazardous locations, adequate protective clothing and uniforms for employees, including caps or hair nets on the feminine workers and the best possible appearance of the buildings, to appeal to these potential customers.

While an attractive plant may be considered a luxury, or in some cases an impossibility, it has a real public relations value. There is no doubt as to which of two products of equal quality will be chosen if one is produced in attractive surroundings and the other is not. One obvious advantage that can be derived from a group of visitors coming to your plant is the chance to make new customers, as well as an opportunity for first-hand contact with your old customers.

Remember too, that the executives or management representatives who take the visitors around the plant are not the only people in the organization from whom the visitors gain impressions of the caliber of your company. Well in advance of the expected arrival of invited visitors, the guard at the front gate should be advised as to whom to expect. The girl at the information desk should also be forewarned. Furthermore, your secretary should be instructed as to how to handle a group in case you should be called out of your office just one minute before the visitors arrive. Finally, the visitors may either be half an hour early or half an hour late, depending on the weather, distance from which the visitors come to your plant, and other unpredictable factors. And, of course, there is nothing like a sample package of your product for each visitor to carry away to help make a more lasting and favorable impression.

If the routine for receiving plant visitors has grown rusty during the war years, now is the time to set it up afresh.

# Nash—the Perfected Vacuum Pump for Evaporators and Condensers

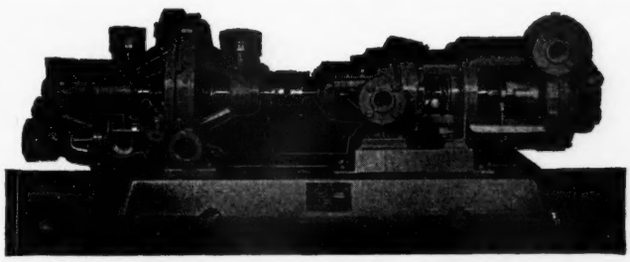


**COMBINATION VACUUM REMOVAL UNIT ESPECIALLY DESIGNED FOR SATISFACTORY OPERATION ON CONDENSERS WITHOUT BAROMETRIC LEG**

Especially designed for drawing air and liquid from high vacuums, the Nash Vacuum Removal Unit is an efficient combination of a standard Nash Vacuum Pump and a Jennings Centrifugal. This design may be had in either motor or steam turbine drive, and may be installed with confidence that it will operate perfectly.

Nash Vacuum Pumps for Evaporator and Condenser Service offer unusual advantages. Vacuum is non-pulsating, producing uniform operating conditions and assuring a better product. Nash Vacuum Pumps have no valves, gears, pistons, rings, or mechanical complications. The single moving element rotates without metallic contact, and no internal lubrication is required. In standard design these pumps maintain vacuums up to 27" of mercury.

Nash Pumps are compact, and require but a fraction of the space taken by old type equipment. They may be installed where convenient, and they operate at suitable speeds for direct connection to either electric motors or steam turbines. Nash engineers will be glad to recommend proper equipment to exactly meet your particular requirements.



**THE NASH VACUUM REMOVAL UNIT MAY BE HAD EQUIPPED WITH STEAM TURBINE DRIVE WHERE THIS TYPE IS PREFERRED**

## NASH ENGINEERING COMPANY

**SOUTH NORWALK • CONNECTICUT, U. S. A.**

# NEW PACKAGES & PRODUCTS

## Dairy Packages

THE latest of a series of redesigned packages for Armour and Co., Chicago, are in the dairy and poultry group. Cloverbloom eggs, butter and process cheese are to be followed soon by table-dressed poultry.

The new Armour logotype, a maroon rectangle with rounded corners and white lettering, appears on the dairy blue background.

The 5-lb. process cheese carton consists of top, bottom and sleeve. The top is done in maroon and blue while the bottom bears the color designating the type of cheese. This will be available also in the ½- and 2-lb. sizes.

Supply conditions are keeping these foods from national distribution for the time being.

## For Display

LAST YEAR, G. Washington Coffee Refining Co., Morris Plains, N. J., planned a display carton for its instant broths, but due to wartime conditions it was impossible to put the packages on the market at that time.

Now the restrictions have been eased and G. Washington's Chicken-Like and Beef-Like Broths are in flat open-end cartons, each carton containing eight individual servings. Package design for both kinds is essentially the same with the exception of a designation color—brown for beef and yellow for chicken.

Each serving is wrapped in heat-sealed cellophane, printed in three colors to coincide with the outer wrap. The display carton, likewise, carries out the same theme.

## Improves Meat Flavor

THE latest achievement of Twin Trees Gardens, Inc., Lynbrook, N. Y., is a spicy basting liquid. Called Dab-It, it serves as a tenderizer as well as a flavor for meats and fowl.

In addition to its use as a basting liquid, Dab-It will enhance the flavor of French dressings and gravies.

Wine vinegar and corn oil make up the base of the product to which an abundant quantity of herbs and spices has been added.

The 6-oz. screw-top bottle bears a simple yellow label printed in brown.

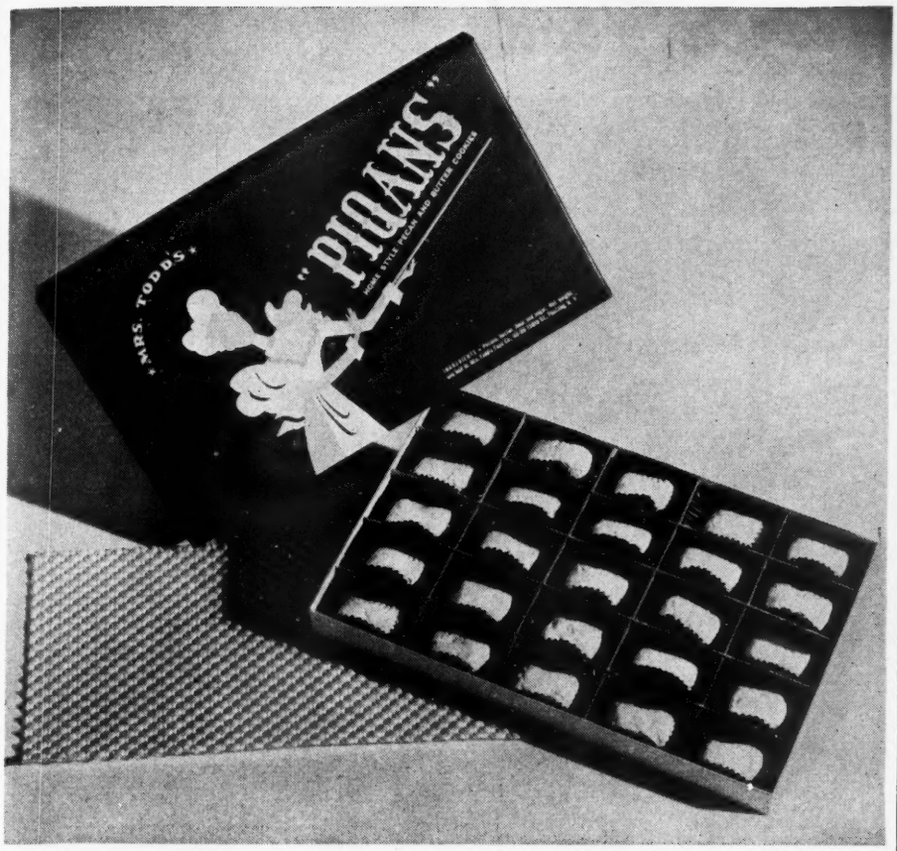
## On the Test Market

RECENTLY introduced on test markets is a new cereal made by the Kellogg Co., Battle Creek, Mich.

Corn-Soya Shreds, made of ribbon milled corn and soya with sugar, salt and malt flavoring are crisp and taste like corn flakes.

They are packaged in a white folding carton with green and red printing, following the design of other Kellogg packages. A waxed paper liner protects the cereal.

The carton is marked "New" and contains pertinent information as to the nutritional advantages of the product. Net weight is 7 oz.




## Tea-Time Snack

A HOMEMAKER'S favorite recipe and the business acumen of an ex-serviceman have resulted in the marketing of a novel cookie delicacy.

"Piqans," made by Mrs. Todd's Food Co., Flushing, N. Y., met immediate acceptance on the consumer market.

Four ingredients—pecans, butter, flour and sugar—make these appetizing tea-time cookies.

They are hand-cut and hand-packed in an attractively designed box. Cardboard partitions mark off 25 individual cubicles in which a cookie, rolled in confectioner's sugar, is placed in a red accordion-pleated candy paper.

Cover motif is a yellow, peach and white lass on a chocolate brown background. Net weight is ½ lb.

## Cocktail Herring

A TWO hundred year old formula from Czechoslovakia was the inspiration for Norland Marinated Cocktail Supreme, packed by Consolidated Brands Corp., Yonkers, N. Y.

The appetizer consists of finely diced herring, apples, walnuts, olives, onions and lemon in a thin sour cream sauce.

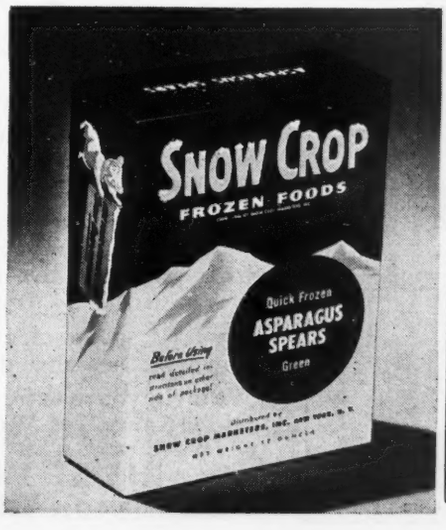
When well drained, the preparation may be used on toast and served with cocktails. Or, with the addition of potatoes, a salad is produced.

It is packed in 7 and 15-oz. glass jars with screw caps. The small yellow and white pasted paper label is printed in black. A chubby court jester winks and says, "Taste Will Tell."

## More Frozen Foods

THIRTY-TWO cities, from Boston to Kansas City, Mo., will be used as key markets for Snow Crop frozen fruits, vegetables, poultry and fish during the initial selling campaign that will start this year.

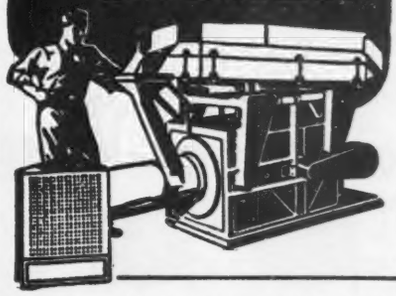
Snow Crop Marketers, New York, has planned an estimated tonnage of 40,000,000 lb. of frozen foods in re-



Stray Bronze

• Yes! And that piece of stray metal should not be found in your finished product! To eliminate this headache of the cereal and other dry food processors, we have developed a new type stoner better than 99% efficient! Revolutionary in design, it removes stones, glass, NON-MAGNETIC as well as magnetic metal, and other hard, dangerous contaminations from wheat, cereals, beans, and other food products with amazing ease. Compactly built, requires little floor space. CAPACITY UP TO 16 TONS PER HOUR! Operation cost as low as 3/5 of 1 H.P. per ton hour! Write for Bulletin FI-546.

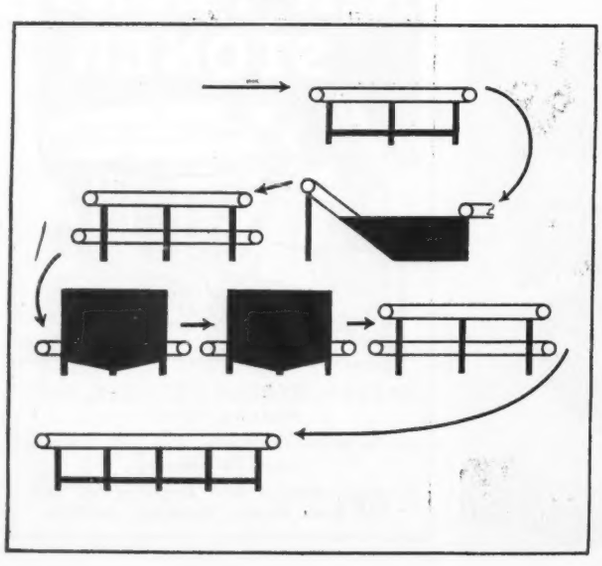
SS&S AIR-FLOAT STONER



SUTTON, STEELE & STEELE, INC.
DALLAS, TEXAS
In Canada—Kip Kelly, Ltd., 68 Higgins Ave., Winnipeg
Foreign—Separations Engineering, Ltd. 133 Bush House, Aldwych, London

# For Frozen Foods...

## GLOBE KANRY-TEX CONVEYOR BELTING WILL HOLD FOR EXCEPTIONALLY LOW *Freezing!*



That's just one feature of Globe Kanry-Tex Conveyor Belting! But that one feature alone has made Kanry-Tex a "leader" in many plants!

All types of food and canning plants prefer Kanry-Tex because of its strong, durable construction, and because it is economical!

Other features of Kanry-Tex are: 1. It resists moisture, alkali, fats and oils... 2. It is sanitary, easily washable with hot water, live steam or sterilizing agents... 3. It is long lasting... 4. It does not impart odor or taste.

With minimum care Globe Kanry-Tex presents a clean, sanitary appearance during its entire life.

We invite you to write today for details and savings offered by Globe Kanry-Tex. Write mill supply houses or directly to us.

**GLOBE WOVEN BELTING CO.**
**1403 CLINTON STREET BUFFALO, N. Y.**

tail-sized containers and 20,000,000 lb. of institutional and bulk products during 1946.

One consumer package has been designed for all the foods to be packed. White snow peaks against a blue ground carry green printing. A red circle frames the product name. Standard folding-type frozen food cartons will be used.

## New Process

TANGERINE lovers now will be able to satisfy their palates year-round, thanks to a new process perfected by Pasco Packing Co., Dade City, Fla.

Tangerine juice, with sugar added, is packed in a No. 2 can under the Old South and Pasco labels.

The royal blue label carries white printing and full-colored reproduction of a tangerine and glass of juice. A feature of the label is the table on the back which gives information as to size of can, net contents, cups and servings.

Quick frozen tangerine segments is another recent addition to the company's list of products. They are packed in both consumer and institutional sizes in wax-coated cartons.

## Salad Oil

CORN OIL with flavor from crushed olives and olive oil has been developed for salads by the Musher Corp., New York.

One-half pint is bottled under the "Lettuce Leaf" brand. The suggestive label is green and white with a colorful salad bowl. The screw cap has a leak-proof inner seal.

# Increased demand for frozen foods

## *makes high-speed wrapping a "must"*

Surveys indicate tnat housewives all over the country are thoroughly sold on frozen foods—and that they intend to buy more and more just as soon as dealers are equipped to supply them... Packers are preparing to meet this increased demand by installing the fastest, most efficient wrapping machine available—the new Model FA.

With this machine, one can turn out 90 perfectly-wrapped packages per minute. A highly improved electric eye insures the accurate location of all printed matter, regardless of the length of the run. Moreover, the type of end-fold made by the FA permits end printing to be on the top flap of the fold, thus assuring perfect legibility. Enlarged spring-floating heater units produce a neat, tight wrap even though the packages being run through may vary slightly in size. Prefrozen foods which vary up to ⅜" in width, and that have caused many headaches, are being wrapped satisfactorily on the FA. And bulging cartons are pressed into shape during the wrapping process.

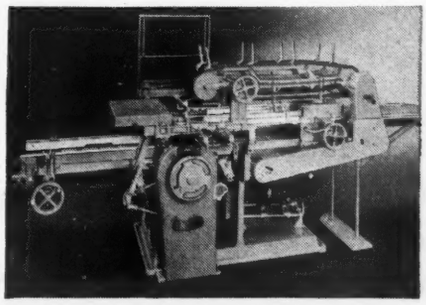
Quickly adjustable for a wide variety of package sizes, tne new Model FA enables you to wrap many different items on the same machine. All adjustments necessary for the change-over can be made by the operator in less than ten minutes.

Prepare now to give your products the attractive, high-speed wrapping they will need to meet competition successfully in this growing market. Consult our nearest office today for complete information regarding the new Model FA.

PACKAGE MACHINERY COMPANY

Springfield 7, Massachusetts

30 Church St., New York 7 • 111 W. Washington St., Chicago 2
101 W. Prospect Ave., Cleveland 15 • 182½ Spring St., N.W., Atlanta 3
443 S. San Pedro St., Los Angeles 13 • 18 Dickens Ave., Toronto 8



PACKAGE MACHINERY COMPANY

Over a Quarter Billion Packages per day are wrapped on our Machines

# *"Could I help it if they gave me quick service?"*

We yield to no one in our respect for the men in white . . . for the swiftness with which they answer calls of distress. But we're right speedy, too, when our customers yell for help. In order to deliver quick repair service, Crown has fast stepping, capable mechanics located strategically throughout the land. For, naturally, when a battery of closing machines, say, acts up ornery, the boss man wants the quick fix, but good. As a Crown customer he gets it. It's one of the many advantages of using Crown cans.

CROWN

FINE METAL CONTAINERS

CROWN CAN COMPANY • PHILADELPHIA • Division Crown Cork & Seal Company, Inc. • Baltimore, Maryland

# FOOD INDUSTRY NEWS

## GENERAL

## Subsoil Moisture Promises Another Record Crop Year

**Present conditions indicate a winter wheat crop of 831,000,000 bu., an increase of 80,000,000 bu. from the December forecast**

CROP REPORTS of the Department of Agriculture and stream flow data put out by the water resources board of the U. S. Geological Survey all indicate sub soil moisture conditions favorable for another crop year of near record proportions.

Early reports in the daily press of the danger of "dust bowl" conditions in the southwestern edge of the Great Plains have not been substantiated by later information on ground water levels in western Kansas and Oklahoma. Late in February, the Geological Survey announced that fears were unwarranted in view of the measurements of ground water resources and stream flow in the area.

Moisture in Kansas soils was approximately 30 percent greater than the 10-year average and considerably higher than in 1936-1940 drought period according to the Geological Survey.

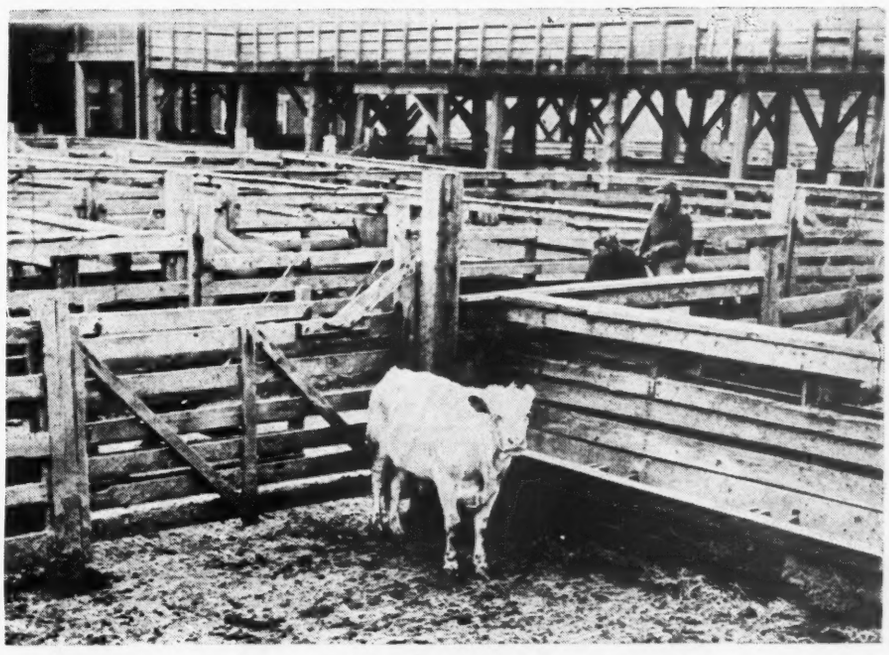
The Department of Agriculture's early estimate of a Kansas spring wheat crop of only 168,000,000 bu. was superseded by the April 10 forecast of an indicated 1946 production of 212,175,000 bu., almost 5,000,000 bu. more than in 1945. This indicates a recovery from the visible damage to the wheat which occurred early in the year and caused the conservative early report.

Speaking of winter wheat only, the crop report of April 1 said, "Production of 831,000,000 bu. is currently in prospect, 80,000,000 more than estimated Dec. 1, 1945." The report went on to say, "Winter wheat prospects improved during the winter months in all parts of the country except the southwest. In the Great Plains where moisture deficiencies caused apprehension at times during the winter, February and March rains brightened prospects in southwestern Kansas and areas to the north and east."

While these estimates may be on the optimistic side, they indicate that another bumper wheat crop is in prospect. Indications are that harvest will start in Oklahoma about June 15, which means about a week or ten days earlier in Texas and that much later in Kansas. Another favorable indication for hard wheat millers is the reduction in acreage planted to "Chiefkan" and "Red Chief" wheats in South Central and Southwestern Kansas. Under the cooperative program of the Kansas Wheat Improvement Association and the Kansas State College these varieties of difficult-to-mill wheat are being replaced by such varieties as "Comanche" and "Pawnee." Last fall about 1,000,000 bu. of the new varieties was available for seed. As a seed supply of these varieties becomes plentiful they will probably completely eliminate the "Red Chief" and "Chiefkan" varieties.

## Packaging Supplies Still Behind Demand

PACKAGING SUPPLIES previewed at the Packaging Conference and Exposition, held April 2 to 5, at Atlantic City, will equal 1945 production. With a reduction in military requirements, supplies available for civilians will increase. Yet, there is little possibility demands will be met in 1946. Fiber shipping containers will equal 1945 production, but requirements will not be met. The tin situation is the most serious packaging problem. The Jan. 1, 1945 stock was about 92,000 long tons. The 1946 supply will be about 42,000 long tons and consumption will be restricted to about 65,000 tons. The glass industry is expected to produce about 5 percent more in



**MOSTLY BY HIMSELF**

**This bull looked pretty lonesome in the Chicago stockyards, April 11, when cattle receipts for the day were down to 4,000 head. But low cattle shipments were only a small part of the trouble. Of the 38,165 head offered for sale that week, 29,428 were bought by eastern buyers, leaving only 8,737 for local packers, compared with 22,873, out of 44,580, bought during the same week in 1945. In all, Chicago packers were able to buy only 25 percent of their normal quota, Swift & Co., for instance, getting 185 head, compared with the previous year's purchase, during the comparable week, of 4,103. Black markets, on the other hand, were flourishing, accounting for 90 percent of all sales in Chicago and more than doubling OPA ceilings in New York. With total slaughterers mushrooming from about 1,400 in 1939 to 26,000, in 1946, the small fly-by-nights can outbid the established packers, who are held to legal ceilings. OPA took a major step in mid-April with the reimposition of slaughter quotas, which it was hoped would correct some of the more flagrant black market abuses.**

1946 than 1945. Yet the glass situation will not be balanced this year. Estimated collapsible tube requirements for 1946 are 8,000,000 gross, estimated supply is 6,000,000 gross.

Packaging machinery production has multiplied. However, the backlog of orders has increased faster than deliveries. An increase in unfilled orders amounts to 160 percent above those of Dec. 31, 1944, representing 15 months' work at present rate of delivery.

An overhauling of packaging programs was suggested for top management. Instead of merely assigning designers work, specific technical objectives, factually determined, should be submitted.

Great advances in product protection were accomplished during the war with no emphasis placed on eye appeal. These advance techniques, in modified form, are applicable to the protection of foods when emphasis is placed on merchandising. The use of a desiccant in the packaging of dehydrated foods was indicated.

Foils and laminations have shown changes. Foil gages 50 in. wide will be available in addition to the conventional 6 in. Foils are now coated with many types of plastics, providing means of heat-sealing, coloring metal and protection against organic food acids. Laminations have been accomplished, such as foil to foil, all kinds and weights of paper, paperboard and certain films.

Currently, planes carry 18,000 lb. of cargo at speeds taking cargoes across the continent in 10 hours. As demands increase, larger cargo-carrying planes will be in service this year. Ton-mile costs will be reduced this year with the advent of larger planes. Speed delays food harvesting until actual ripening, thus bettering quality.

Postponement of modifying Rule 41 of the railroads suggesting increasing the weights of liner board was suggested, pending results of container-testing programs. The shipper should not be burdened with increased packaging costs based on a wartime claims picture.

The Institute of Paper Chemistry, Appleton, Wis., is undertaking extensive field studies to correlate laboratory tests with field performance. The evaluation and performance of various shipping container material testers were discussed.

## Hutson Resignation Brings USDA Changes

MANY changes occurred in the top personnel of the Department of Agriculture as a result of the sudden resignation of John B. Hutson, who was undersecretary and head of the Production and Marketing Administration, to become deputy secretary general for the United Nations. Norris E. Dodd was sworn in as undersecretary on April 8. Robert H. Shields was moved up to take the positions of administrator of the Production and Marketing Administration and president of the Commodity Credit Corporation, posts formerly held by Mr. Hutson. Jesse B. Gilmer was appointed deputy administrator of PMA and CCC vice-president.

Among the unannounced appointments in PMA are those of C. C. Farrington and E. A. Meyer, who are assistant administrators. In addition to their new duties they continue to function in their old positions. W. C. Crow and Gordon P. Peyton are deputy assistant administrators for regulatory and marketing service work and also retain the duties of their previous offices.

The Department of Agriculture is now set up on commodity lines. Within PMA in particular there seems to be no place for functions and policies to be coordinated. If this estimate is correct further changes and reorganizations may be expected.

"IF WE COULD ONLY THINK OF SOMETHING WE COULD MAKE FOR A NICKLE, HELL, WE'D MAKE A FORTUNE!"

## Foundation Reveals Frozen Food Tests

MORE than 100 firms in the frozen foods processing, packaging, equipment and research fields were represented at the final day's meeting of the Frozen Food Foundation, Inc., in Syracuse, N. Y., March 28 to 30. The group, learning at first hand the objectives of the Foundation, heard the prediction that it will not be long before freezing will be the most important method of preserving perishable foods. The need for packers, warehousemen, brokers and retailers to work together in maintaining high standards of quality, was also discussed.

The foundation's research program, the group was told, includes the formation of quality standards for frozen foods, improvement of present staple food items and development of new products that lend themselves to freezing, research into the chemical and physical aspects of freezing foods, improvement of plant equipment and processes through bacteriological research and the study of packaging materials and design. This work, under the technical direction of Gerald A. Fitzgerald, is being carried out with a staff of trained technicians from various universities and industrial organizations.

A short history of the foundation revealed that it is a non-profit research organization, established in the spring of 1945, by the sponsors of Frozen Food Products, Inc., a merchandising group composed of several of the nation's leading department stores, the Carrier Corp., and the Aviation Corp. This group, formed in 1943, carried out merchandising tests in Syracuse by in-

# for Salad Dressings Only

## a One-Purpose Starch with a longer shelf life

**PURITY "PWS" is a complete salad dressing starch that... cooks to a creamy, glossy paste . . . cools to a smooth consistency that blends uniformly with the emulsion . . . ages without losing its original creamy texture and gloss.**

We invite you to test the longer shelf life of PURITY "PWS". It is a superior food starch—especially developed by National's Food Laboratory research—for salad dressings only. It is complete in itself. It ends the need of blending two or more starches in your shop—and eliminates all variations in salad dressing quality caused by shop errors in weighing.

PURITY "PWS" has been thoroughly tested in commercial use. It has a bland flavor . . . is snowy white . . . absolutely pure. It produces superior salad dressings with a creamy texture . . . excellent appearance . . . and a delightful tang that is free of the cereal flavor found in ordinary corn starch.

Write for National's new handbook: SALAD DRESSING PRODUCTION. It provides a basic understanding of the ingredients, operating procedures and formulas—that make a salad dressing a delicately balanced food product.

National also produces: PURITY "C", a quality starch thickener for fruit fillings; MELOJEL, a better all-purpose food starch; FLOJEL candy starches in all accurately controlled fluidities; MOLDING STARCH, properly lubricated for gum drops, etc.; PURITY GLAZE, an oil-sealer for coating almonds; and AMIOCA, the new domestic starch.

*Offices:* 270 Madison Avenue, New York 16; Boston, Philadelphia, Chicago, Indianapolis, New Orleans, San Francisco and other principal cities. In Canada: Meredith, Simmons & Co., Ltd., Toronto. In Holland: Nationale Zetmeelindustrie, N. V. Veendam.

**National**
STARCH PRODUCTS

STARCHES — AND SPECIALTIES WITH EASILY DEMONSTRATED SUPERIORITY

# Shortening Clean-Up Time

Big ones or little ones, your clean-up crews finish in record time with Metso Granular*. The twin action of Metso lifts the toughest film of greasy or oily dirt and then floats it all away, preventing the removed dirt from redepositing. Less effective cleaners leave behind a greasy film which you can feel. Metso leaves surfaces dry and greaseless.

Metso is easy to use and conveniently available in 100-lb. bags and 300-lb. barrels. Specify Metso on your next order. Distributors are located in over 65 cities.

**Philadelphia Quartz Company**
**Dept. D, 125 S. Third St.**
**Philadelphia 6, Pa.**

**metso**
*Cleaners*

*Sodium Metasilicate U. S. Pat. 1898707


stalling 240 Frostmaster home storage cabinets in carefully selected homes. These cabinets, plus 60 already owned in the city, formed the basis for the operations. After two years the tests are reported to have shown an increase in per capita consumption of frozen foods from $6 to $200 per year among the 300 families.

## Frozen Food "Fair" Leaves Some Doubts

WITH several food and food equipment company displays vying with a miniature circus, a ball game and a booth featuring gypsies, in a portion of New York's Park Avenue armory, the Frozen Food Institute, Inc., held what the management termed its "5th annual exposition and convention," March 27 to 31. The Institute is not to be confused with the Frozen Food Foundation, in Syracuse, N. Y., an entirely separate organization.

An Institute spokesman declares that delegates and visitors came from "Holland, France, Nova Scotia, British Columbia, Canada, and practically every state in the Union." A number of those active in the domestic frozen food field were actually in attendance, from out of town, expecting to profit from the technical program scheduled. Many of these registrants were disappointed in the handling of the sessions, however, and were critical of the addition of a sideshow atmosphere to what had been publicized as an important conference from the standpoint of the industry. There was some popular interest in the exposition, but it is not known whether the serious exhibitors considered their efforts rewarded.

## CPA Will Approve All Essential Building

CONSTRUCTION required by manufacturers in essential industry, of which food processing is one, will experience little or no difficulty in securing approval from the Civil Production Administration, according to one of the top CPA officials. Provisions of the veterans' housing program require special authorization for all construction, alterations and installations of building equipment costing more than $15,000 for any one building.

Refusal to grant this authorization, however, will be confined to those projects the agency considers nonessential. Food processing equipment also is exempted from the order as the restrictions on equipment apply only to fixtures and


**CASE HISTORY No. 5**

One in a series of factual experiences of a group of American manufacturers with Multiwall Paper Bags.

**COST COMPARISON**

| | 100 lb. Burlap Bags | 100 lb. Paper Bags |
|---|---|---|
| Bag cost per M..... | $296.20 | $17.85 |
| Bag cost per 100 lbs.... | .296 | .118 |
| Labor cost per 100 lbs... | .125 | .050 |
| Total bag and labor cost per 100 lbs..... | .421 | .168 |
| Savings per 100 lbs. paper over fabric.... | | .253 |
| Savings per ton, paper over fabric..... | | 5.06 |

**DETAILS OF LABOR COSTS**

| *Burlap Bags (with paper liners)* | | Production per hour | Cost per 100 lbs. |
|---|---|---|---|
| 1—Man filling at .82 per hour | $.82 | | |
| 1—Man weighing at .82 per hour | .82 | | |
| 1—Man sewing at .89 per hour | .89 | | |
| 3—Men handling at .82 per hour | 2.46 | | |
| 6—Men in all | $4.99 | 4000 lbs. | .125 |
| *Multiwall Paper Valve Bags* | | | |
| 1—Man filling and check-weighing at | .82 | | |
| 3—Men handling at .82 per hour | 2.46 | | |
| 4—Men in all | $3.28 | 6500 lbs. | .050 |

**CLASS OF PRODUCT PACKED**

| | |
|---|---|
| CEMENT | FERTILIZER ✓ |
| CHEMICALS | FOOD |
| FEEDSTUFFS | MISCELLANEOUS |

**PRODUCT CHARACTERISTICS**

| | |
|---|---|
| ABRASIVE | GRANULAR |
| CORROSIVE | HEAVY |
| DELIQUESCENT ✓ | HYGROSCOPIC ✓ |
| FLUFFY | LIGHT |
| FREE-FLOWING | VISCOUS |

ST. REGIS BAG PACKAGING SYSTEMS are made in a variety of capacities, speeds, and manpower requirements to suit specific products and plant layouts. Machines are available in types to meet the special characteristics of a wide range of products, with filling speeds as high as twenty-four 100-lb. bags per minute—with one operator.

# HOW A ST. REGIS PACKAGING SYSTEM SAVES MONEY

## for a manufacturer having limited* production

This fifth case history in a series of MULTIWALL success stories, relates the savings effected by a cocoa manufacturing concern through the introduction of St. Regis Multiwall Paper Valve Bags and Machine Packaging. Prior to the installation of the St. Regis Packaging System this company used various types of packages . . . barrels, fibre drums, and open-mouth burlap bags with paper liners. Since their initial trial, about one year ago, St. Regis Multiwall Paper Valve Bags have been found to be the most efficient and economical container for the purposes of this company.

**REDUCED LABOR COSTS:** Prior to adopting the St. Regis Packaging System this company was using one man to fill the bags, one to weigh them, and one to sew them closed. Now, one operator can fill and check-weigh 25 more 100-lb. bags per hour than the former three man crew . . . a labor saving of 66% in filling and weighing.

**INCREASED PRODUCTION:** The original three man filling crew and a three man handling crew were able to handle only 4000-lbs. of cocoa per hour. Since the installation of the St. Regis Packaging System one man is able to supply the three-man handling crew with 6500-lbs. of cocoa for shipment to customers . . . an increase in production of 62½% over the old system.

**AN EXAMPLE IN PACKAGING ARITHMETIC**

**QUESTION:**

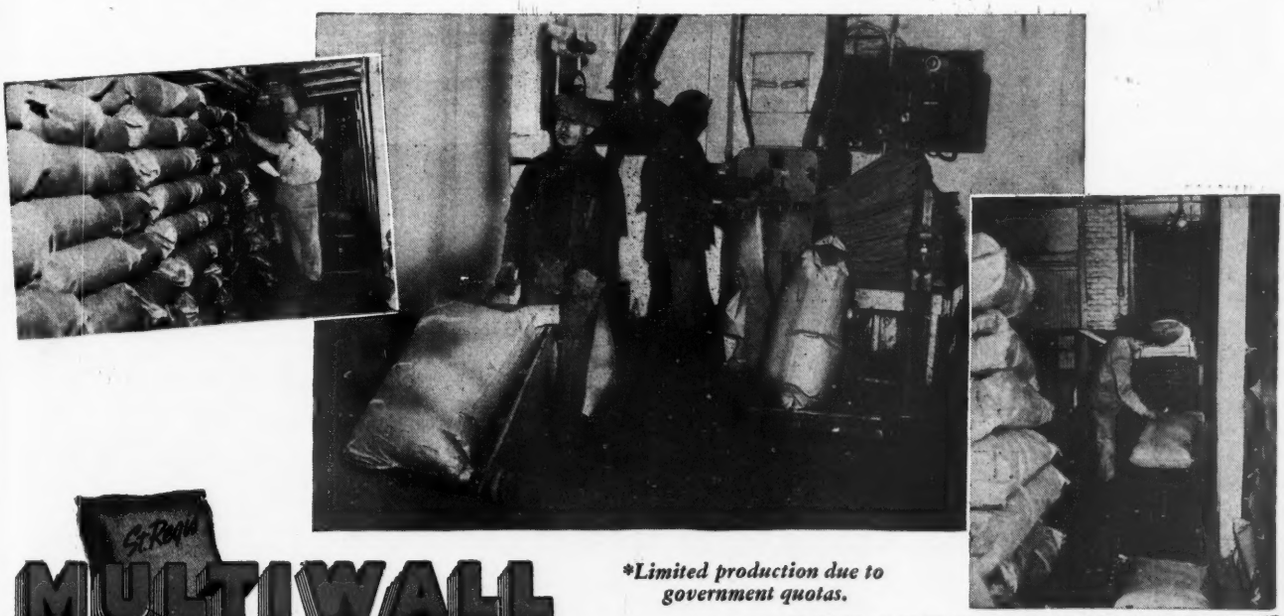
If it took three men one hour to fill, weigh and close 4000-lbs. of cocoa . . . how can one man fill, check-weigh and close 6500-lbs. in an hour?

**ANSWER:**

By changing over to a St. Regis Packaging System using a St. Regis Valve Bag Packer to fill Multiwall Paper Valve Bags.

**REDUCED CONTAINER COSTS:** In addition to the product protection afforded by multiple walls of kraft paper and the greater ease of handling Multiwalls, the customer discovered a saving of over 55% in bag cost by using Multiwall Paper Bags instead of Burlap Bags with paper liners.

The figures in this example prove conclusively that St. Regis Packaging Systems are just as applicable to small packaging operations as they are to operations that require batteries of high-speed packers. Call in a St. Regis field representative to advise you on the type packer that will best suit your needs.



MULTIWALL

*Limited production due to government quotas.*

**ST. REGIS SALES CORPORATION**

(Sales Subsidiary of St. Regis Paper Company)

NEW YORK 17: 230 Park Ave. CHICAGO 1: 230 No. Michigan Ave.
BALTIMORE 2: 2601 O'Sullivan Bldg. SAN FRANCISCO 4: 1 Montgomery St.

*Mail this coupon for the complete story*

Birmingham Boston Cleveland Dallas Denver Detroit
Franklin, Va. Los Angeles Nazareth, Pa. New Orleans
No. Kansas City, Mo. Ocala, Fla. Oswego, N. Y. Seattle Toledo

IN CANADA: St. Regis Paper Co. (Can.) Ltd., Montreal, Vancouver.

*Without obligation,* please send me full details regarding "Case History" No. 5, outlined above.

NAME_____

COMPANY_____

ADDRESS_____

The Zenith Pulp Press, with capacity up to 26 tons per hour, thoroughly dewaters wet pulps and slurries such as:

**Beet Pulp • Citrus Wastes • Tomato Pomace • Cherries • Corn Fibre • Paper Pulp • Reclaimed Rubber, etc.**

Heavy screw-type spindle applies smooth, continuous pressure, forces pulp or slurry against selective resistance. Rifled drilled resistors permit use of steam when necessary. Minutely perforated screens assure efficient drainage, hold pulp losses to minimum. Ball thrust bearings and oversize shaft bearings reduce power load.

New uses for the remarkably efficient, profitable Zenith Pulp Press are being constantly developed. An experimental press is available for trial in your plant.

Write for full information.

**JACKSON & CHURCH CO.**
**SAGINAW, MICHIGAN**

mechanical equipment, which are attached to the building and used as part of it.

For example, if air conditioning equipment is intended for keeping a candy packing room at the temperature and relative humidity required by good commercial practice, such equipment is exempt. On the other hand, if the air conditioning equipment is to be used for maintaining comfortable conditions in the entire building, including offices and salesrooms, the restrictions of the order would apply.

Elevators, conveyors, process piping, control and testing equipment and refrigeration installations are specifically exempted because these are not in conflict with the housing requirements. Power generating equipment such as boilers, generators and transformers also are exempted provided the purpose of such installations is not to provide heat and light for the building.

Repair and maintenance work in food factories are not restricted. Maintenance in this sense is defined as: "the minimum upkeep necessary to keep a structure in sound working condition." By repair is meant "the restoration of a structure to sound working condition when the structure has been rendered unsafe or unfit for service by normal depreciation, damage, failure of parts, etc."

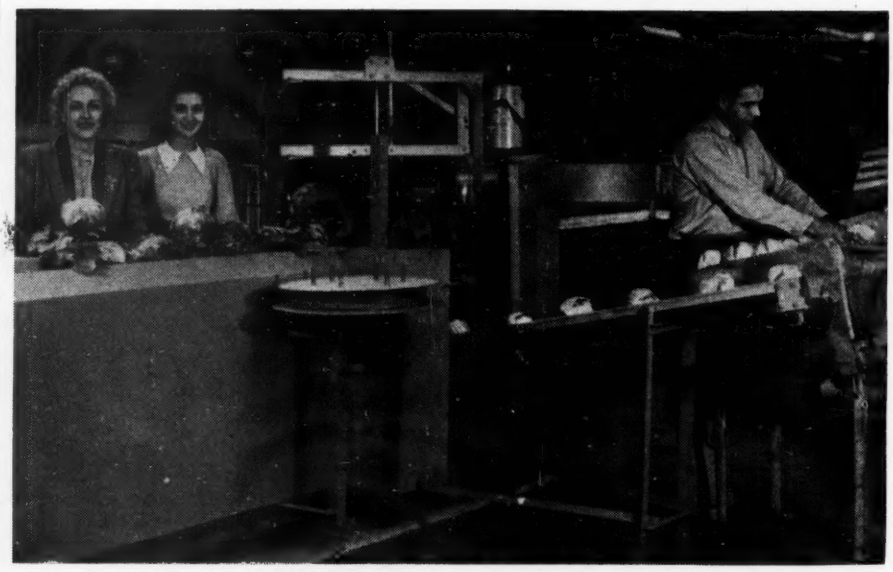
To obtain an authorization for construction and alteration of a food processing plant that would cost more than $15,000, an application must be filed with the local CPA Field Construction Office. The formal application, contained on a special form, will be reviewed by a committee appointed by the CPA and composed of local representatives of the building industry and the community in general.

All applications will be reviewed on the basis of their possibilities in eliminating bottlenecks in reconversion, as well as the extent to which the proposed construction will interfere with the housing program.

## Fishing Ships

SOME 55 surplus Army, Navy and Coast Guard craft of several different types soon will be made available to the Alaskan fishing and freighting industries, according to the Department of Interior.

Included in the surplus ships, which are located at Ketchikan, Adak and Seward, are seven 148-ft. cargo ships, 18 barges and lighters, five 36-ft. picket boats, two small tugs, one 6,500-barrel tanker, three 38-ft. buoy boats, one 50-ft. picket boat, fourteen 50-ft. Coast Guard patrol boats, four "rearming" boats designed to service hydroplanes, and one 50-ft. picket boat.



**LETTUCE WRAPPER**

**Hard-to-handle lettuce is automatically wrapped by this new machine at the rate of 48 to 60 heads per minute at full speed. Premium heads of lettuce, after sorting, are fed into the machine on the left side by a conveyor belt, where a crew of women watches for culls or protruding leaves. The belt places each head under a cup-shaped wooden plunger, which pushes it down through four mechanical fingers onto a sheet of cellophane. The plunger revolves swiftly while the fingers lift the corners of the cellophane to the top. Soft wire fed from a large spool on the machine is then looped around the "neck" formed by the corners of the cellophane sheet, pulled tight and automatically snipped off. The head of lettuce then falls through to another conveyor which delivers it to the wrapping-out man at the right of the machine, who packs 48 heads to a fiber case for air shipment. Cellophane-wrapped lettuce flown east weekly by a Salinas, Calif., produce packer, is reported showing no signs of wilting or effects of temperature changes during its 3,000-mile air haul.**

# YOUNG MATRONS VOTE 3 TO 1 FOR FOODS PACKED IN GLASS!

Modern young housewives display the strongest preference for the modern package—a glass container.

Millions of smart, young women are becoming homemakers each year. Their overwhelming vote in favor of foods and household products packed in glass was established in a recent survey by a noted public opinion analyst.* It is sending glass popularity up . . . up!

Here's why these alert young matrons say they choose glass-packed products:

## ATTRACTIVENESS:

*Glass-bright displays are eye-inspiring, invite their purchase. These modern containers add color and a spick-and-span sparkle to their pantry shelves.*

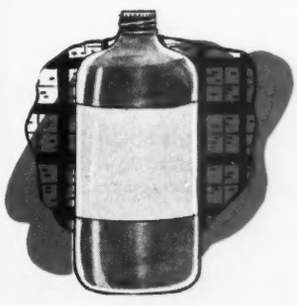
## VISIBILITY:

*They see what they want —want what they see when it's packed in glass containers. Glass shows size, style, color and the amount. Goodness sells itself.*

## PROTECTION:

*Food in glass keeps fresh, flavorful . . . tastes good. 64.7% of young mothers interviewed prefer glass-packed baby food—they trust the safety of glass.*

## CONVENIENCE:



*A glass container is easy-to-handle . . . keeps clean . . . shows when to buy more. Leftover portions can be stored in the original container. No waste!*

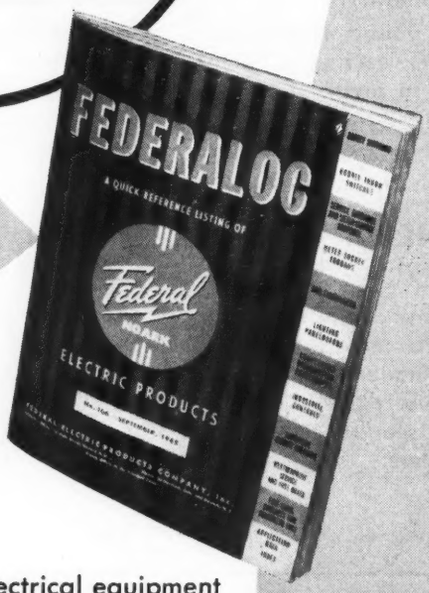
Duraglas containers have all the advantages of glass packages and more. Their lightweight strength assures easy handling . . . their trim proportions mean compact storing . . . their natural beauty makes sparkling displays. You sell more . . . need less selling time . . .with products packed in glass containers—Duraglas Containers!

**Name supplied upon request. Average is based on eight key classifications: pears, peaches, fruit salad and cocktail, baby food, coffee, salad or cooking oil, beets, food-beverages.*

ESPECIALLY IN Duraglas CONTAINERS

OWENS-ILLINOIS GLASS COMPANY · TOLEDO 1, OHIO · *Branches in Principal Cities*

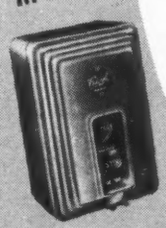
You'll find everything you want to know about Motor Controls...in the **FEDERALOG**




Bring your electrical equipment data file up to date . . . with a copy of the FEDERALOG! Just off the press, the FEDERALOG is one of today's most-needed catalogs on Motor Controls, Safety Switches, Circuit Breakers, Service Equipment, Panelboards and Multi-Breakers.

Mail the coupon today!

MOTOR CONTROLS FOR THE **FOOD** INDUSTRIES



MANUAL A.C. STARTER. Bulletin 404—available for motors up to 5 hp 220 v and 7½ hp 440-600 v.

FEDERAL ELECTRIC PRODUCTS CO., INC.
50 Paris St., Newark 5, N. J. (Dept. F-5)

Please send a copy of the FEDERALOG to

Name and Title_____

Company_____

Address_____


## Canned Bean Standards Hearings Announced

AMENDMENTS to the standards for canned green and wax beans have been proposed by the Food and Drug Administration and printed in the Federal Register of April 9 on pages 3754 and 3755. A public hearing will commence at 10 a.m. on May 14 in Room 3106, South Agriculture Building, Washington, D. C., with Bernard D. Levinson as presiding officer. Basic changes in identity standards are few, most of the new material being in the form of new quality standards. Interested persons may submit affidavits in lieu of oral testimony. However, the lack of opportunity for cross examination will be considered by the Administrator in determining the weight to be attached to such affidavits.

## Food Industries Adds To Editorial Staff

FOOD INDUSTRIES added two new members to its staff, during the past month, when Alice M. Wilson took over the reader's service duties and John V. Ziemba became an assistant editor.

Since receiving a B. A. in Chemistry, at Wellesley, Miss Wilson has engaged in research work on ascorbic acid at Harvard Medical School, and as a chemist in plant quality control with the New England Confectionery Co., Cambridge, Mass. She also served in the U. S. Navy as a senior grade lieutenant, working in the field of electronics.

Mr. Ziemba holds a B. S. in Bacteriology and an M. S. in Water and Sewage Treatment, from Rutgers. He has been a research assistant at the New Jersey Agricultural Experiment Station; Sewage Investigator in New Brunswick, N. J.; jr. chemist, New Jersey Bureau of Foods and

ALICE M. WILSON

# Some of the many advantages of Gas and Modern Gas Equipment

- Dependability
- Versatility
- Simplicity
- Minimum Capital Investment

When the operator turns on the Gas control, he knows that this modern fuel will go to work at once, evidence of its dependability.

No matter what special conditions obtain in your plant, Gas will be found the most versatile fuel. It is readily adaptable to any food processing problem. There is Gas equipment to meet any situation in the application of heat industrially.

Gas equipment is the easiest to introduce to any processing plant; there is no other source of heat for processing operations that can surpass this modern fuel in simplicity of equipment, yet do such a successful job.

For the benefit of the established enterprise or the new venture, it is well to know that Gas and Gas equipment require, usually, only minimum capital investment. That is because Gas equipment is modest in first cost, dependable, versatile in application, simple to utilize, economical to operate and requires no investment in stored fuel. The Representative of your local Gas Company is always available for consultation on any problem that requires heat in your production operations.

THE TREND IS TO GAS
FOR ALL HEAT PROCESSING OF FOODS

**AMERICAN GAS ASSOCIATION**
**420 LEXINGTON AVENUE, NEW YORK 17, N.Y.**

# YARWAY Spray Nozzles

INVOLUTE TYPE FOR CONE-SHAPED SPRAY

## for WASHING • RINSING • COOLING • HUMIDIFYING

Get the most out of your Spraying Equipment without unnecessary power or liquid waste.

Use Yarway Nozzles. No internal vanes or other restrictions to clog or hinder flow. Two types —Yarway Involute type producing a fine cone-shaped spray with minimum energy loss, and Yarway Fan type producing a flat, fan-shaped spray with time-saving slicing action for cleaning.

Wide range of standard sizes and capacities. Cast or machined from solid bar stock.

Many thousands in use. Write for literature.

**YARNALL-WARING CO., 127 Mermaid Ave.**
**Philadelphia 18, Pa.**

FAN TYPE FOR FLAT SLICING SPRAY

# Paksure
FOOD PACKAGINGS

## WILL HELP SELL . . . YOUR FOOD PRODUCTS

Anything in the food line . . . including frozen foods . . . protectively packaged and *attractively displayed* in "Paksure" Food Packagings, will keep moving in a steady stream, from dealers' shelves to the cupboards of Mrs. America.

Our 1946 line of wrappings, bags and envelopes, utilizing cardboard, plain or printed glassine, cellophane, pliofilm, laminated papers, etc., will secure that necessary "point-of-sale" appeal for your most commonplace product.

Stock packagings supplied . . . or distinctive, *original* designs to order. Inquiries invited . . . write today.

**PACKAGING DIVISION** 777 Public Ledger Bldg.
**E. W. Twitchell Incorporated** Philadelphia 6, Pa.

JOHN V. ZIEMBA

Drugs; chemist-bacteriologist, Garrett & Co., wineries; chief bacteriologist and mycologist, Killian Research Laboratories; head bacteriologist and chief chemist, Quaker Maid Co., Inc., and research chemist in the packaging pilot plant, Armour & Co. His experience, particularly in packaging and frozen food research, gives the publication an authority through whom it can further develop its editorial treatment of these important fields.

## PROCESSING

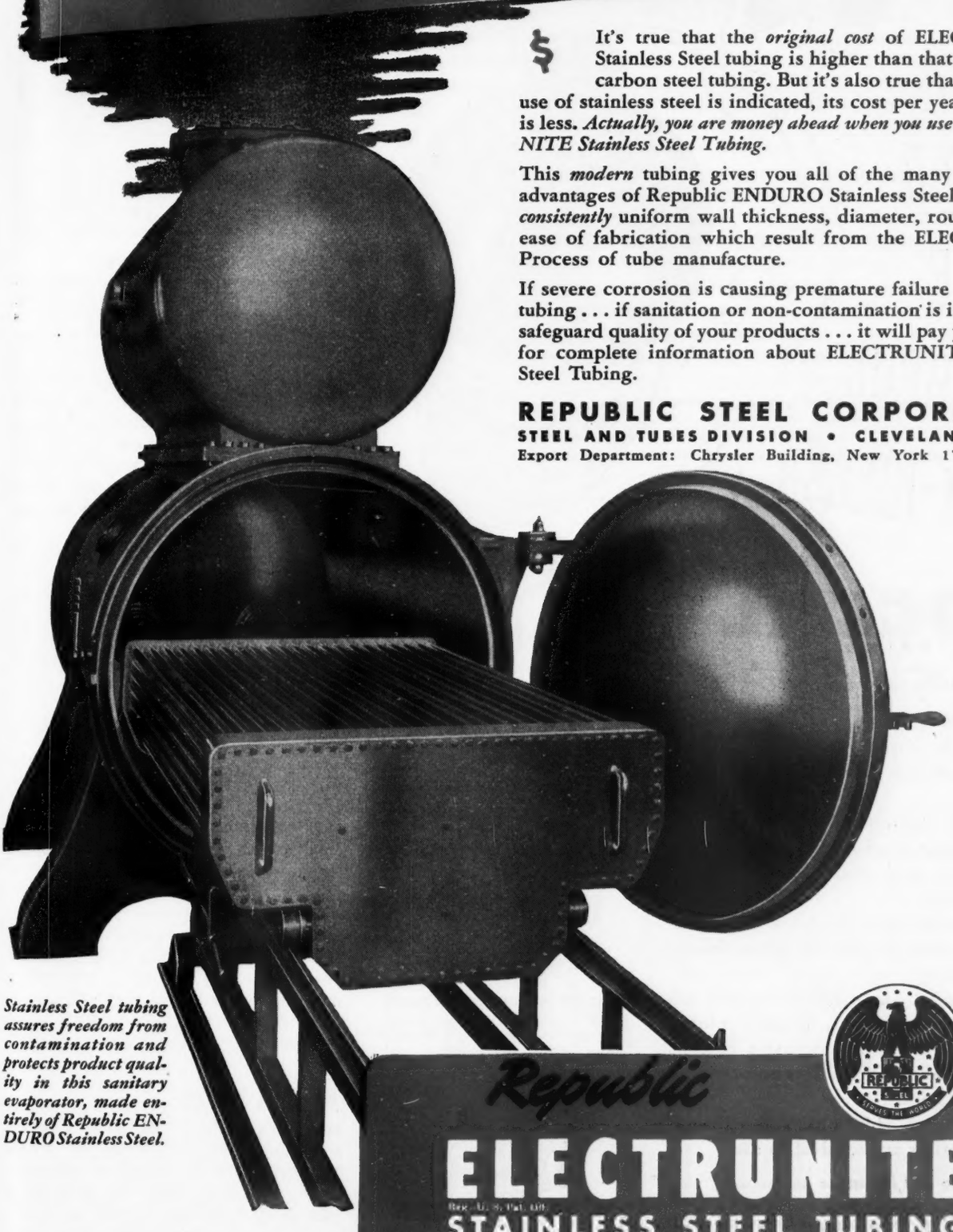
### Ice Making Machine Cuts Cost and Time

A NEW ice-making method, by which it is claimed ice can be produced cheaper and almost 100 times quicker than by existing commercial processes, has been developed at the University of Texas refrigeration laboratories.

Experiments have indicated that ice can be made at a cost of about five cents per 100 pounds by the new machine, which its inventors believe can be manufactured for as little as $700 complete with its source of refrigeration. Three forms of ice can be made by the new process: (1) flake ice, 1/16 of an inch thick, for dairies, restaurants, drug stores and hotels; (2) coarse crushed ice for icing milk trucks, fishing boats, and packing of poultry, fish, vegetables, etc., for shipment; (3) solid ice cakes.

The new machine reverses the existing process of freezing ice from the outside toward the center of a cake by first freezing the core and then depositing successive layers onto the outside of it. The layers are about 1/64 of an inch thick and freeze on solidly in eight to ten seconds. Underlying principle of the

# *How Expensive is* ELECTRUNITE STAINLESS STEEL TUBING?



*Stainless Steel tubing assures freedom from contamination and protects product quality in this sanitary evaporator, made entirely of Republic ENDURO Stainless Steel.*

It's true that the *original cost* of ELECTRUNITE Stainless Steel tubing is higher than that of ordinary carbon steel tubing. But it's also true that, where the use of stainless steel is indicated, its cost per year of service is less. *Actually, you are money ahead when you use ELECTRUNITE Stainless Steel Tubing.*

This *modern* tubing gives you all of the many cost-saving advantages of Republic ENDURO Stainless Steel—PLUS the *consistently* uniform wall thickness, diameter, roundness and ease of fabrication which result from the ELECTRUNITE Process of tube manufacture.

If severe corrosion is causing premature failure of ordinary tubing . . . if sanitation or non-contamination is important to safeguard quality of your products . . . it will pay you to write for complete information about ELECTRUNITE Stainless Steel Tubing.

**REPUBLIC STEEL CORPORATION**
**STEEL AND TUBES DIVISION • CLEVELAND 8, OHIO**
**Export Department:** Chrysler Building, New York 17, New York

*Republic*
**ELECTRUNITE**
Reg. U.S. Pat. Off.
**STAINLESS STEEL TUBING**

**Also Carbon Steel Mechanical Tubing — Aircraft Tubing — Boiler, Condenser and Heat Exchanger Tubes**

# You asked for it!

## A SAFER, MORE POWERFUL GERM-KILLER

**ROCCAL**
BRAND
*Sanitizing Agent*

The germicide of tomorrow is here . . . ready to go to work for you right now . . . it's ROCCAL.

ROCCAL *kills bacteria.* It inhibits growth of molds, algae, iron-bacterial growth and slime-forming organisms which "bug-up" plant operation.

You can use ROCCAL for every sanitization job . . . it contains no phenol, active chlorine or heavy metals.

ROCCAL is *safe* . . . in recommended dilutions it is non-poisonous, virtually odorless and tasteless—it is non-corrosive and will not injure metal or fabrics. It is non-irritating to operator's hands.

Effective in high dilutions and extremely stable, ROCCAL is economical to use.

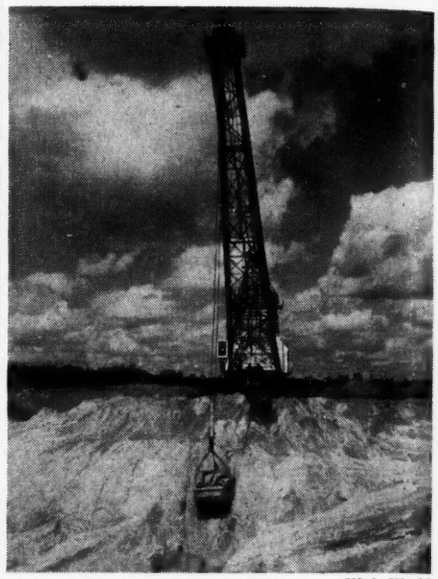
***Sample and literature on request.***

*Industrial Division*
**WINTHROP CHEMICAL COMPANY INC.**
Dept. W-56, 170 Varick Street, New York 13, N. Y.

**FOOD PROCESSING PLANTS**
Keeps equipment and storage areas sanitary. Inhibits growth of molds and slime-formers.

**COLD STORAGE AND LOCKER PLANTS**
Reduces spoilage losses by keeping refrigerators and lockers sanitary. Does not affect odor or taste of food.

**FISHERIES AND FISH PACKERS**
For sanitizing storage areas of fishing boats and canneries, filet machines, shrimp de-veiners, etc.

*Wide World*

**PHOSPHATE MINE**
**Peak production of phosphate, needed as fertilizer, has been reached in Polk County, Fla., where about half the world's supply is mined. This scoop can handle a full-size auto.**

process is the fact that as freezing progresses from the outside within a mold under the existing method it hinders the heat flow out of the unfrozen water, thus requiring possibly 30 times as long for the center to freeze as the outside and as long as 48 hours for the whole.

The new machine, which several firms are expected to start manufacturing soon, was developed by John R. Watt with the assistance of Dean W. R. Woolrich of the College of Engineering and Dr. Luis Bartlett, mechanical research engineer.

## Wartime Techniques

TECHNIQUES developed during the war by the National Research Corporation are being used in production of a new frozen orange juice concentrate at the new $1,000,000 Vacuum Foods Corp. plant at Plymouth, Fla.

The new installation, using an entirely new low temperature process, is capable of handling 20,000 gal. of fresh orange juice daily and has a potential capacity of 40,000 gal. A dehydrated orange juice powder also will be made at the Plymouth plant.

## Borden Builds

BORDEN'S Gridley Division has let contracts for construction of a new modern dairy fronting on Milwaukee's Michigan Ave. It will be a two story building of brick and concrete construction with basement. The new building will be used for receiving, pasteurizing and bottling

# NOW AN ALUMINUM ALLOY with elephant-hide toughness for your food equipment

As fast as we can convert, new Wear-Ever equipment is being made of a tougher, harder aluminum alloy than ever before practical. Think what this means in even longer wear—in lasting economy that cuts maintenance costs.

Because it is so hard, this new aluminum alloy, with its famous Smoothard finish, offers unparalleled resistance to denting and scratching. Equipment made from it retains its shape—stays smooth, new-looking and easy-to-clean.

That's not all. You'll like the way Wear-Ever aluminum cooking equipment spreads heat quickly and evenly. Aluminum is friendly to foods, too, protects their flavor, taste and purity. And it's light to handle.

Wear-Ever equipment in the extra-hard alloy is on its way. Tell us your needs. The Aluminum Cooking Utensil Company, 305 Wear-Ever Building, New Kensington, Pa.

**Wear-Ever Aluminum Steam Jacketed Kettles**

Records attest to the fact that prewar Wear-Ever kettles often lasted for 20 or more years. Think how much longer the new kettles, made from this even tougher alloy, will last.

NOW... MORE WEAR THAN EVER IN

# WEAR·EVER ALUMINUM

Made of the metal that cooks best ... easy to clean

WEAR-EVER ALUMINUM TRADE MARK REG. U.S. PAT. OFF.

Here's the Answer to your HEAT SEALING problem!

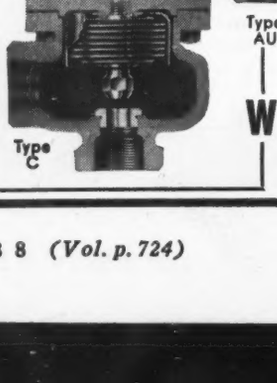
Sealtight
THE HEAT SEALING MACHINE THAT HAS STOOD THE TEST OF TIME

Heat Seal-It Company, pioneers and original producers of bag heat sealing equipment, now offer their new and improved line of "Pacer" Models. The result of 13 years experience exclusively in this field, there is a Sealtight machine for every purpose. Write for our general catalog, illustrating all models with complete information.

SEND FOR CATALOG TODAY!

HEAT SEAL-IT COMPANY
4318 PARRISH ST., PHILADELPHIA 4, PENNA.

Plant tests show these
NICHOLSON TRAPS




HAVE
2 to 6 Times More Discharge Capacity

PLANT RECORDS show that installations of Nicholson thermostatic steam traps have increased production of steam-heated processing units as much as 30%. Pick out some "problem" lines and apply Nicholson Traps. See for yourself why they're well-known for speeding up steam circulation. For other exclusive features send for Catalog 444 or see Sweet's.

W. H. NICHOLSON & CO.
193 OREGON ST., WILKES-BARRE, PA.

milk, for manufacture of ice cream and for condensing of milk in bulk. Costing almost $800,000, the new air conditioned plant is expected to be completed by next spring.

## Claim Long Life for German Canned Bread

CANNED BREAD, made in quantity for military consumption in Germany during the war, will keep for as long as 10 years, claim master bakers interviewed by U. S. technical investigators.

Known as "Dauerbrot," the bread was made by conventional German methods and formulae. One recipe called for 200 kilograms of rye flour, mixed with 180-190 liters of water at 26 deg. C. To 100 parts of this mixture was added 45 parts of a ferment dough. The mass then was kneaded, formed into dough balls by a rolling machine, and placed in special round or square tins. It was baked at 220-250 deg. C. for 80 to 90 minutes.

Round pans were used for bread that was to be hermetically sealed in cans, sterilized and stored indefinitely. Square loaves were wrapped and stored for two to three months. U. S. investigators report that the bread sliced well, seemed rather soggy and heavy, but had a good taste.

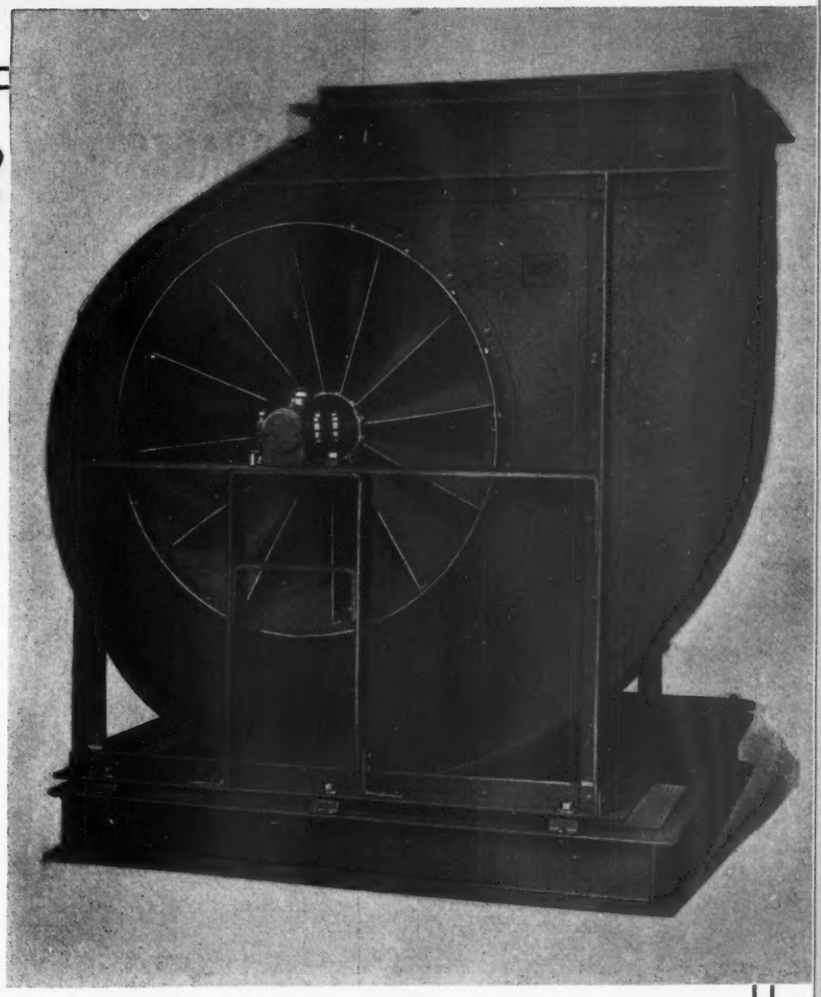
## Corn Meal Standards Hearings Adjourned

AFTER taking 800 pages of testimony, exclusive of affidavits and exhibits which will be made part of the hearing record, the corn meal standards hearings were adjourned from mid-March to April 23 at the request of the American Corn Millers Federation. The witnesses who appeared during the March session were primarily National Research Council and State nutrition representatives. In general the proposals of the Food and Drug Administration were supported, though detailed amendments were suggested in certain phases of the proposed standards. The official findings of fact and proposed order will probably be issued about the middle of the summer.

## Study Liver Oils

IT has been reported that the University of Washington may receive $29,000 of federally appropriated funds needed to continue its study of comparative values of fish-liver oils during the coming year. Prospect that the appropriation, recommended for deletion by the Bureau

# *Lower Cost* per cfm with this "Buffalo" LIMIT-LOAD FAN



There are good fan engineering reasons for the superior performance of Buffalo Fans on the job. These include fixed inlet vanes for quiet, efficient operation, wider and deeper curved blades, smooth housing. TRUE cut-off with tangent off the wheel coinciding with flare cut-off, insuring equal airflow over the entire outlet.

As a result of this design, Buffalo fans when tested in the system deliver MORE air—from 4% to 14½% more air under certain conditions.

Your consulting engineer knows "Buffalo" fans. Ask him about them. Write us for Bulletin 3339.

## BUFFALO FORGE COMPANY

152 Mortimer Street — Buffalo, N. Y.

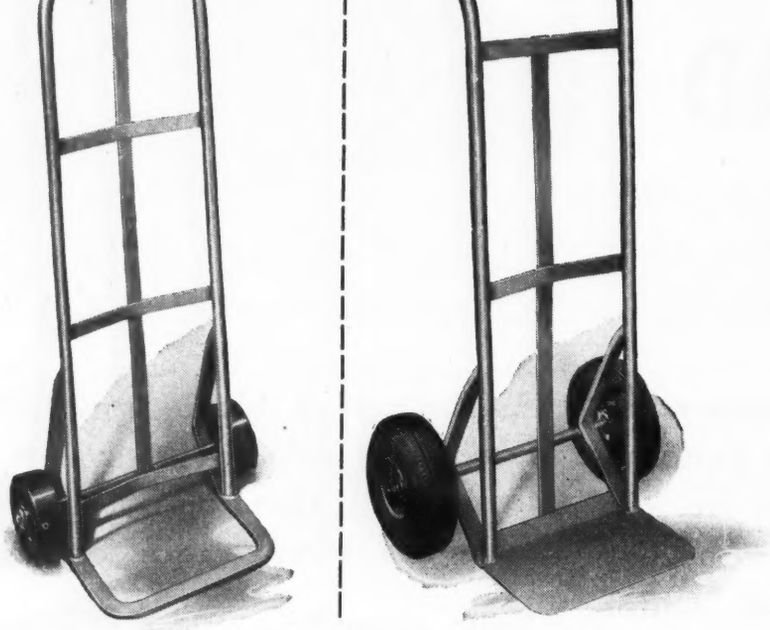
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" first for fans

TYPE "LL" QUIET Fans

# CASES, KEGS AND PACKAGES *can't walk*

but it's easy wheeling with a *WHEEL-EZY*



Cases, kegs and packages can't walk and you're wasting time, labor and money if you lug them about by hand. A Rapids-Standard *Wheel-Ezy* hand truck will give you *easy wheeling* with these bulky objects and will keep your handling costs low. Bottlers, brewers, distributors, super-markets and delivery men are finding increasing use for the Wheel-Ezy. There is a use for at least one in every plant. Strong, lightweight and perfectly balanced, Wheel-Ezy handles loads up to 500 pounds with ease. "Step-Climber" feature makes it possible to go up and down steps in easy fashion. Now available in one and two handled models, open or solid plate nose. Write for literature and price lists — no obligation.

**CHOICE OF WHEELS** AGH—Demountable Cushion rubber wheels . . . it's *tough*. MOCH—Moulded on Cushion Rubber Wheels, moulded to metal core. ABK—Plastic wheel with laminated fabric tread, moulded under heat and pressure. MRK—Resinoid Wheels made of sturdy canvas duck, macerated and moulded under heat and pressure. Plain or Roller Bearings. NICRO STEEL—Fine quality grain castings, fully machined. Oilite Bearings, zerk lubrication. GP—General Pneumatic with 10" x 3.50" demountable rubber tires.

OFFICES IN PRINCIPAL CITIES

*Manufacturers of*

STEEL FORGED CASTERS - TRUCKS - CONVEYORS - POWER BOOSTERS

The Rapids-Standard Co., Inc.

Sales Division—361 Peoples National Bank Bldg., Grand Rapids 2, Michigan

**SUGAR RESEARCH**

**Dr. H. S. Paine, newly-appointed vice-president in charge of research and development for Refined Syrups & Sugars, Inc., is responsible for recent completion of a modern lab and for a model pilot plant now under construction at the company's Yonkers refinery.**

of the Budget, would be reinstated, appeared fairly certain late in March. A special fish oil laboratory was set up at the University during the war by the Fish and Wildlife Service.

## Retail Bakers Form Own Sanitary Code

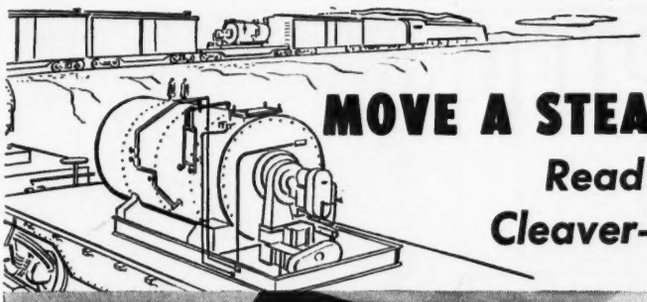
FORMULATION of a complete sanitation code for retail bakeries, for which nationwide adoption will be sought, has been entrusted to a special committee appointed by Charles W. Koch, president of the Associated Retail Bakers of America.

The committee proposes to make a thorough study of existing state and municipal regulations in order to assemble and coordinate the best of existing sanitation measures and exclude those that experience has shown to be ineffectual or unreasonable. To this end, it is asking all members of the ARBA and secretaries of affiliated associations to send the Executive Secretary of ARBA copies of their local regulations together with suggestions and comments.

The committee also has recommended establishment of local committees on sanitation to assist in preparing the new code and then in encouraging its acceptance.

## Labor Supply

WARNING canners that no prisoners of war and only a limited supply of Mexicans and Jamaicans will be available this season, the United States Employment Service has an-



# MOVE A STEAM PLANT 'CROSS COUNTRY?

## *Read this Travelogue of Four Cleaver-Brooks Steam Generators*

URGENTLY in need of steam generating equipment, a prospective buyer on the West Coast heard of four steam "boilers" available in the East. Questions of purchase arose. Would it be much of a job dismantling them? Would it be worth while in terms of cost involved? If they could be shipped — how soon? How long would it take to re-install them?

Now these four available boilers were Cleaver-Brooks self-contained or "packaged" steam generators. Things began to happen. Within a few hours, the generators were loaded on flat cars and started on their 3000 mile journey.

Re-installation was equally simple. Since no settings or smokestack were required, the boilers were set into place, necessary service connections made, and in a short time these Cleaver-Brooks generators were in full operation.

The cost? . . . the original "boiler" and its component investment were fully recovered, except for minor installation costs. The above picture shows the final installation—note the clean, efficient appearance.

### Custom-planned —

Every Cleaver-Brooks Steam Generator is built to the measure of an individual plant's needs, and Cleaver-Brooks assumes full responsibility for the satisfactory selection and initial operation of the unit.

A qualified engineer analyzes load conditions, space and machinery arrangements. After installation, a factory engineer puts the steam generator into operation and trains plant employees on its operation, care and maintenance.

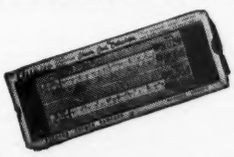
### Self-contained and "packaged"

Delivery consists of a "packaged" unit. Connections to service outlets are all that is needed. No smokestack is used — a simple vent carries away all products of combustion. No extra foundation is required. Compact — the unit fits into limited space and low headroom locations. Sizes: 22 models — 15 to 500 hp; pressures 15 to 200 lbs. p.s.i.

### Money-making performance—

The Cleaver-Brooks Steam Generator is designed for easy operation and low upkeep cost. Operation is at 80% efficiency from full load down to 30% of its rating. The high heat transfer from the 4-pass, down-draft boiler produces fast steaming. A boiler room as clean as the home or office is possible through use of oil for fuel.

**CLEAVER-BROOKS COMPANY, 327 E. Keefe Avenue, Milwaukee 12, Wis.**



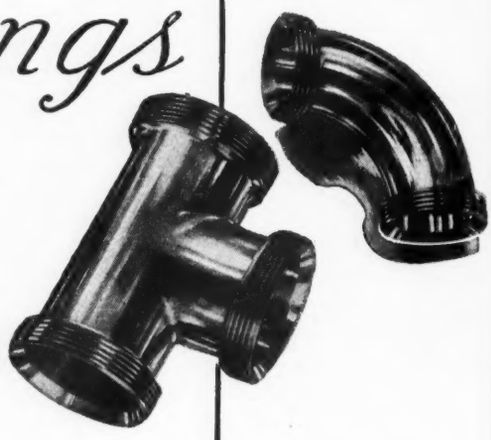
**WRITE ON YOUR BUSINESS LETTERHEAD** for the Free Steam Cost-Calculator — a ready-reference slide rule showing the comparative steam costs when using oil or coal as fuel.

**Cleaver-Brooks**
STEAM GENERATORS

# APPROVED and ACCEPTED

## *Sanitary Fittings*

New specifications announced for sanitary line installations demand that more exactness in types and qualities of sanitary fittings be used. Tri-Clover Machine Company manufactures in accordance with the 3-A Standards.



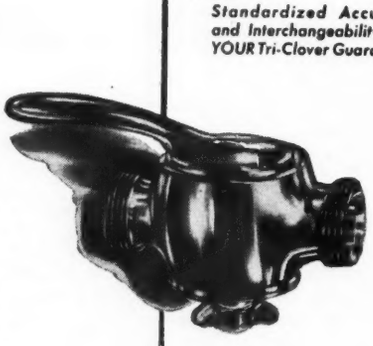
With labor costs at peak heights, it is practical and economical to insist on precision engineered TRI-CLOVER Fittings, Couplings, Unions, Elbows, Tees and Valves. Tri-Clover engineered products speed up assembly operations and assure a continuous highly polished sanitary conveyance for liquid and semi-liquid food products.

THE *Complete Line*

1. Trialloy (Cupro Nickel) Sanitary Fittings
2. Fabricated Stainless Steel Sanitary Fittings
3. Pumps (Centrifugal—non-agitating) Trialloy and Stainless Steel
4. Custom Fabrication
5. Sediment Testers
6. Line Filters

*Standardized Accuracy and Interchangeability are YOUR Tri-Clover Guarantee.*

***Fittings designated, accepted and announced as meeting the 3-A Sanitary Standards by the appropriate Committees of the International Association of Milk Sanitarians, U. S. Public Health Service, and Dairy Industry Committee:***



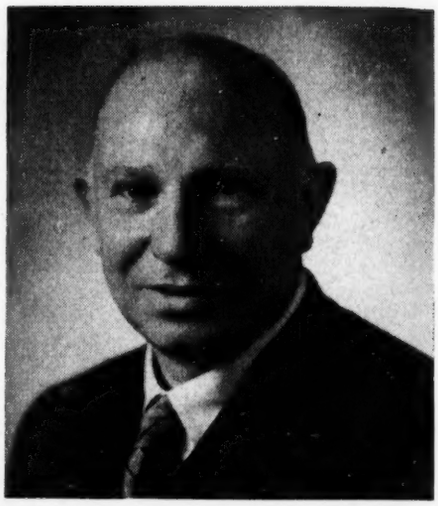
| | |
|---|---|
| 2-C Bend | 9 Cross |
| 2-F Bend | 10-BF Valve |
| 2-K Bend | 10-C Valve |
| 2-P Bend | 11-C Valve |
| 7 Tee | 13-H Hex Nut |
| 7-A Tee | 14-R Ferrule |
| 7-B Tee | 15-R Ferrule |

| |
|---|
| 16-A Cap |
| 30-F Angle Valve |
| 31-15 Reducer |
| 32-15 Reducer |
| 33-F Can Filler |

Try TRI-CLOVER

**SANITARY FITTINGS**
**VALVES and PUMPS**

**TRI-CLOVER MACHINE CO.**
KENOSHA - - - - - WISCONSIN

**BRITISH VISITOR**

**Dr. D. W. Kent-Jones, one of England's top consultants on cereal chemistry, crossed the Atlantic, in April, to visit several American cities, prior to his appearance on the program at the annual meeting of the American Association of Cereal Chemists, at Niagara Falls, Ont., May 13 to 16.**

nounced that it will work with farm extension officers in recruiting domestic labor from several southern states.

Canners are urgently requested to supply these agencies with information on their labor requirements. The plan is to direct plant representatives individually, or in groups, to areas in which labor is or will be available and let them do their own recruiting with the assistance of local USES and extension representatives.

## More Food Plants to Handle Texas Surplus

A NUMBER of quick-freezing and dehydration plants are now under construction to handle the surplus expected from the tremendous output of the 800,000 irrigated acres in the Rio Grande Valley of Texas.

Seven quick-freezing plants are either in operation or near completion at Brownsville, McAllen, Harlingen, San Carlos and Port Isabel. Their products range from citrus segments, spinach, broccoli, Mexican pineapple, bananas, cocoanuts to shrimp and fish.

Sites of new dehydration plants are McAllen, LaFeria, Elsa, Weslaco, San Carlos, Raymondville and Brownsville. They will process cereal grasses, alfalfa, citrus peel, tomato and lemon powder, pectin extracted from fruit juices and a number of chemical by-products.

The new plants represent investments ranging from $250,000 to $500,000 and employ from 200 to 800 workers in two to three daily shifts.

# A good place to live is a good place to work!

To look out of your office or factory window—and see green fields and wooded mountains! To step directly from work—to clean country air, health-giving sport, the kind of community you want to bring your family up in.

What man—whether executive or worker—wouldn't prefer to work in a place where he can really live, too?

Take Antrim, New Hampshire, for instance, where the Goodell Company has been producing quality cutlery for 71 years. From local and South American markets raw materials are brought to them over Boston and Maine lines—go forth as finished products for world-wide distribution.

Their strategic location near foreign and domestic markets is important. So is their access to excellent power, water and modern transportation. But *most* important is the fact that like all communities in Northern New England this town is "a good place to live", a town where a majority of the workers own their own homes, where all play a real part in the life of the community.

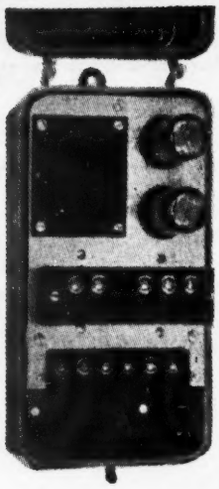
In today's competitive market, "weigh the scales" in *your* favor by locating your new plant in this region famous for generations for a *settled* and skilled laboring population.

For available sites, write your requirements to: E. F. Reed, Manager, Industrial Department, Boston and Maine Railroad, Boston 14, Massachusetts.

BOSTON and MAINE RAILROAD

"MINUTE MAN SERVICE"

*Automatic Controls*
*That Save Material and Labor*



***Faratron Electronic***
**LIQUID LEVEL CONTROL**

**prevents overflow waste and emptiness damage. Operated by electronic action, the FARATRON signals or controls the level — high or low — of any kind of liquid at any temperature, in any type of container or processing machine, either open or closed, free or under pressure.**

**Absolutely safe, absolutely sure, accurate to 1/16th inch. Needs no attention. Write for descriptive Bulletin 144.**

**LUMENITE INTERVAL TIMER**

**signals or controls the timing of any program or operation in split seconds to hours. Automatic reset and repeat or manual reset. Dependable, accurate, long-life, heavy duty construction.**

**Write us your requirements or ask for Bulletin 144T.**

**Lumenite Electronic Co.**
**407 S. Dearborn Chicago 5, Ill.**

DISTRIBUTION

## Cornell Undertakes Frozen Food Study

RESIDENTS of Ithaca, N. Y. and surroundings Tompkins County will be given first priority on home and farm freezer equipment, which they will either buy or rent from several manufacturers, in order that the area may serve as the basis of an intensive study of the effect of an abundance of frozen foods and home freezer services on the life of the community.

The experiment is the important phase of a long-range study of community frozen food services initiated by Cornell University in May, 1945. Participating in the project are several leading suppliers of freezer equipment and nine New York State public utility companies.

Over the next several months interviewers from Cornell's School of Nutrition will be calling on families who obtain freezer equipment to ask questions relating to every phase of the use of cabinets. Thus, in addition to keeping tabs on the nutritional aspect, they will seek facts which are expected to guide further development of freezing equipment.

One interesting angle of the project its promoters believe will be to discover to what extent more than 900 present locker renters at Ithaca's Mother Zero food freezing and processing plant will surrender their space in favor of buying or renting home cabinets.

## Candy and Beer Makers Slowed by Grain Cut

EFFECTS of the order curtailing supplies of grain for industrial use are already being experienced in two major fields of the food manufacturing industry. One is the reduction of deliveries of draft beer and the other is an increasingly tight situation in the supply of corn syrup and corn sugar for confectionery, bakery, and beverage use.

Delivery of draft beer has been cut 30 to 60 percent. Pabst Brewing Co. now delivers draft beer only in the states where its plants are located. Other large breweries may cease draft beer deliveries entirely, forcing many outlying taverns out of business.

In 1939 the Mexican shipment of beer to this country was 10,000 barrels. The importation this year is expected to be approximately 500,000 barrels, unless the Mexican government takes steps to prohibit the export as Holland has already done. It

# The Anchorglass Container

## IS A MINIATURE SHOW WINDOW

THRIFTY housewives have learned to "window shop" not only store fronts, window displays and show cases, but packaged goods of all kinds. It is natural and easy for them to see and evaluate at a glance. That's why stores have show windows. That's why food packers are turning to sparkling crystal glass containers. Each Anchorglass Container is a miniature show window which displays your products with all their colorful eye and appetite appeal.

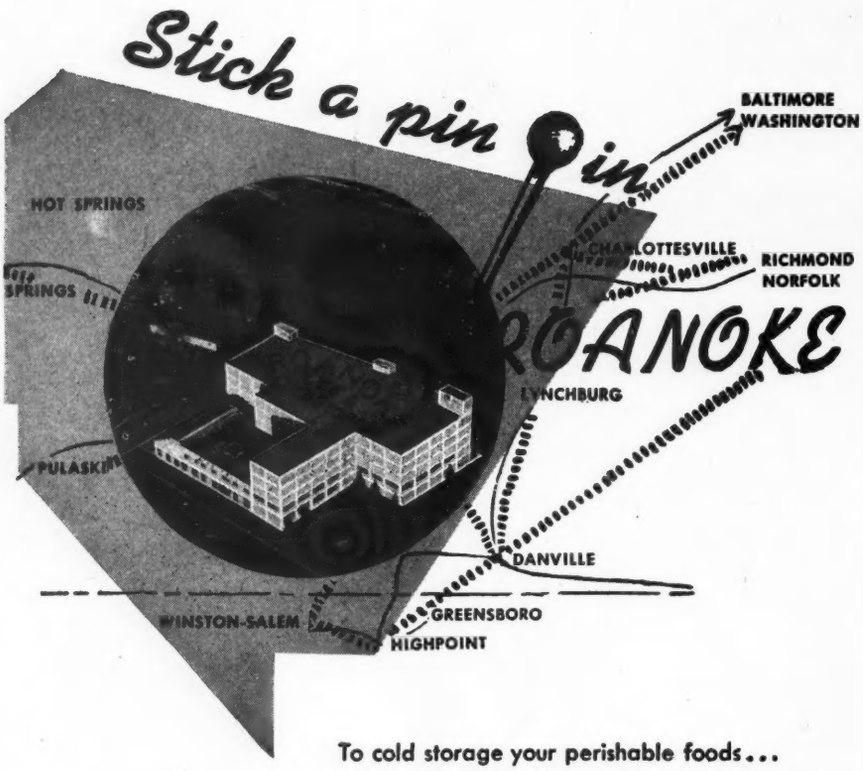
Too, the Anchorglass Container imparts no foreign tastes or flavors. It delivers your choice foods to the consumer without losing any of the original goodness packaged at your plant. It is easy and safe to open and can be tightly and easily resealed to protect unusued portions. It's a convenient, sanitary, protective and attractive package.

Make it possible for the housewife to see your product and your sales volume will be increased.

Anchor
CONTAINERS and CAPS

Listen to ANCHOR ROCKING'S HOBBY LOBBY
CBS NETWORK . . . THURS. EVE.

PRODUCTS OF
ANCHOR HOCKING GLASS CORPORATION
LANCASTER, OHIO




To cold storage your perishable foods... choose Roanoke. More than 1,000,000 cubic feet of cooler and freezer space. Private siding on N & W main line and adjacent to the Virginian and C & O. Ideal arterial roads. For financial protection ... careful handling ... rapid distribution ... "stick a pin in Roanoke". A natural by the map. Icing facilities available. Write for illustrated folder.

COCHRAN HEALD ICE CO.

**Roanoke Ice & Cold Storage**

ROANOKE, VIRGINIA

**CHICKEN UNDRESSER**

**Only a matter of seconds is required to denude a chicken, turkey or other fowl of even its pin feathers when this machine is employed. Known as the Mercury Poultry Picker, it uses an electric-driven drum roller containing rows of long, flexible rubber fingers. The chicken is laid against the fingers, which whip the feathers off and with no damage to the skin. The machine can pick 200 fowl an hour.**

is coming in cases and the bottles are 11 oz. instead of the 12-oz. American bottle size.

The smaller breweries of the country are asking a preference in the restriction in the use of grain. All the small breweries together use no more than the four largest breweries in the country. This 30 percent cut may put some of them out of business entirely. No wheat is required for the production of beer, but about 20 percent of the nation's barley crop is required.

The other effect on this grain reduction is evidenced in the prediction of shorter candy supplies, less cake and soft drinks. Most confectioners have been getting just enough corn syrup and sugar to operate, and the already tight situation in corn syrup and corn sugar will be aggravated further by this new 20 percent reduction in the corn grind. Many confectioners are already operating part time only.

## Canned Foods Consumption

PER CAPITA consumption of canned vegetables, in the United States, increased from 23.39 lb. canned weight, in the crop year 1939-40 to 25.43 lb. in 1940-41, last normal prewar crop year, according to a survey made by the American Can Co.

For the same comparative crop years, the per capita consumption of canned fruit showed a gain of from 17.86 lb. to 19.22 lb. Canned toma-

# 3 reasons for using *PC FOAMGLAS* INSULATION in your food plant

The ideal insulating material should be:
(1) efficient
(2) economical
(3) permanent

PC Foamglas—air sealed in glass cells—is widely known as the insulating material that meets all those requirements.

PLANT owners all over the country have installed this cellular glass material on roofs and processing equipment, in floors and core walls. They can tell you that PC Foamglas licks the toughest insulating jobs—for good.

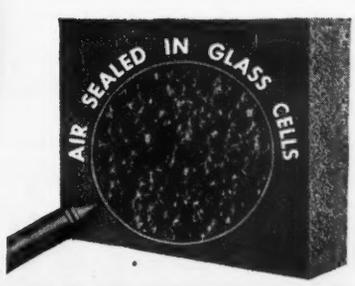
Composed of millions of tiny air-filled glass cells, PC Foamglas is *impervious* to moisture, vapor, vermin, the fumes of most acids, many elements that cause other materials to lose insulating efficiency. It helps to maintain temperature and humidity levels *permanently*.

PC Foamglas is light, rigid, strong. It stays in place, does not pack down, check, warp, rot, swell, shrink, or burn. Big pieces are easily handled, quickly installed. PC Foamglas needs no repairs, maintenance or replacement during ordinary use. And the sum total of those advantages is *economy*. For with PC Foamglas, first cost is last cost.

We have published complete detailed information on PC Foamglas in three illustrated booklets. Send for your free copies today. Just check and mail the convenient coupon. You incur no obligation. Pittsburgh Corning Corporation, Room 144, 632 Duquesne Way, Pittsburgh 22, Pa.

· *Also manufacturers of PC Glass Blocks* ·

On flat deck built up roofs, in core walls and floors, and on processing equipment, PC Foamglas assures effective, economical insulation—permanently.




**PC FOAMGLAS** *Waterproof Fireproof* **INSULATION**
T. M. REG. U. S. PAT. OFF.

Pittsburgh Corning Corporation
Room 144, 632 Duquesne Way
Pittsburgh 22, Pa.

Please send me, without obligation, your free booklets on the use of PC Foamglas insulation for:

Roofs_____ Walls_____ Floors_____

*Name*_____

*Address*_____

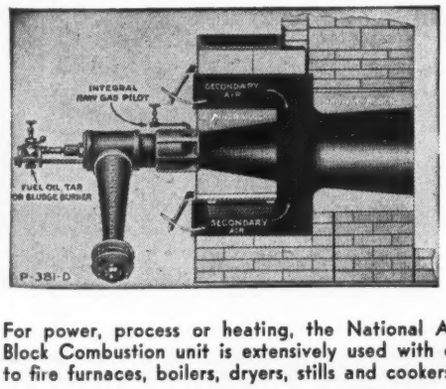
*City*_____ *State*_____

"LIQUIDS WORTH STORING ARE WORTH MEASURING"

THE LIQUIDOMETER CORP.
38-14 SKILLMAN AVE., LONG ISLAND CITY, L.I., N.Y.

YOU WILL FIND THIS NATIONAL AIROIL TANDEM BLOCK COMBUSTION UNIT

EXTENSIVELY USED . . .
IN THE FOOD INDUSTRIES

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for FUEL OIL
. . . for GAS

For power, process or heating, the National Airoil Tandem Block Combustion unit is extensively used with great success to fire furnaces, boilers, dryers, stills and cookers.

Quick change can be made from one fuel to the other with no alterations. Control of flame position is accurate and positive. This versatile unit features efficient combustion, easy regulation and minimum maintenance.

Write for further details. Engineering advice available; consult us about your problems.

NATIONAL AIROIL BURNER Company, Incorporated
1272 EAST SEDGLEY AVENUE, PHILADELPHIA 34, PENNA.
Texas office: 2nd National Bank Bldg., Houston

OIL BURNERS • GAS BURNERS • GAS PILOTS • PUMP SETS • EXPLOSION DOORS
ACCESS DOORS • AIR DOORS • BURNER BLOCKS • FURNACE OBSERVATION WINDOWS


toes led all other vegetables with a pound per person increase, with canned peas a close runner up. Consumption of canned peaches showed a per capita gain of 1.1 lb. and grapefruit and pears increased substantially.

## Cocoa With Milk Shows No Unwholesome Effect

COCOA added to milk or ice cream in normal quantities apparently has no deleterious effects on calcium metabolism of the adult human body, researchers at the University of Illinois concluded following a series of experiments.

The research was initiated by the National Dairy Council after previous experiments on rats at Massachusetts State College had led to the belief that cocoa added to milk might interfere with the utilization of milk calcium by children. Nutritionists, on the other hand, pointed out that the Massachusetts experiments were conducted with cocoa in the ratio of 3.3 parts milk to 1 part cocoa, whereas in chocolate milk ordinarily the ratio is 13 parts milk to one part cocoa.

## Dried Eggs Bought

GOVERNMENT dried egg purchases were stepped up considerably in April as a result of the Department of Agriculture having increased its procurement requirements from 25,000,000 to 45,000,000 lb. When the revised procurement schedule was issued on March 21, the department needed 17,000,000 lb. more to fulfill commitments. Purchases are being made on an offer and acceptance basis. Procurements, all for foreign countries, go largely to Britain.

## Australian Flour

GOOD HARVESTS throughout the Australian wheat belt raise hopes that flour exports, which were resumed last month for the first time since war began, will increase steadily. Initial flour shipments were slated for the impoverished Far East, Tahiti, India and Ceylon. A drought last year prevented Australia from making earlier shipments.

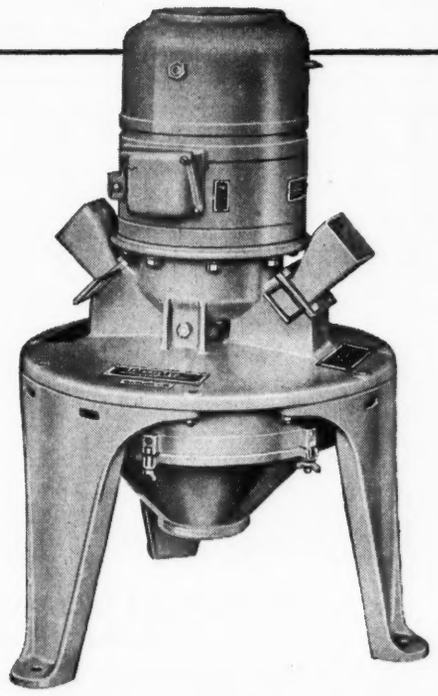
## Sardine Imports

SHIPMENTS of canned sardines totalling 325,000 cases from Portugal and Spain and their colonies are slated for the U. S. market, as a result of a recent allocation made by the Combined Food Board. This is an increase of more than 50 percent over quantities made available last year.

# PROTECT 80% FLOUR

## "ENTOLETER" SYSTEM GIVES CONTINUOUS

# BUG CONTROL *plus!*



**1 KILLS ALL INSECT LIFE**

Now, more than ever, your plant and products need the "ENTOLETER" system of continuous insect control. It helps you to avoid waste of scarce food materials . . . to protect 80% flour . . . to insure the high standards of your products.

**2 ESSENTIAL IN FRAGMENT CONTROL**

The "ENTOLETER" system is being used successfully to reduce fragment count. Send for copy of our latest bulletin describing methods of application.

**3 AIDS PRODUCT UNIFORMITY**

Food plants and flour mills have found that the "ENTOLETER" system offers an excellent means of blending flours, mixing ingredients in compounds and improving vitamin distribution. This, alone, more than justifies its cost.

**ENTOLETER**
INFESTATION DESTROYER
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**CONTINUOUS INSECT CONTROL SYSTEM**

ENTOLETER DIVISION
The Safety Car Heating and Lighting Co., Inc.
P.O. Box 904, New Haven 4, Conn.

Send full information on "ENTOLETER" Continuous Insect Control System.

Name .....

Company .....

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City, Zone and State .....

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Missouri has more to offer industry than it can tell in many times this amount of space. Be it parent plant or branch, it behooves industrialists everywhere to take these facts into account before making any move.

New State Constitution favorable to industry. Low Taxes. Over 950 new corporations last year. Adequate water supply. Skilled and semi-skilled native labor in abundance. Unsurpassed transportation facilities. Rich retail and wholesale market. Wealth of natural resources. Low cost power. 350 alert communities eager to cooperate with any worthy enterprise.

*Specialized, confidential service to industrialists. Write direct: Missouri State Department of Resources and Development, Dept. 706, Jefferson City, Missouri.*

**THE STATE OF MISSOURI**
**IN THE HEART OF AMERICA**

## RAW MATERIALS

### Creeping Fruit Trees Produce in Siberia

THROUGH the development of "creeping trees", Russian scientists have succeeded in growing apples, pears, and plums in Siberia, where winter frosts reach –45 deg. C.

The trees, which hug the ground instead of growing vertically, are covered with straw and fir branches, and are under a heavy blanket of snow during the winter months.

Professor Alexander Kiziuri of Omsk Agricultural Institute first developed this type of tree for Siberian cultivation. The Kiziurin apples, as they are called, produce more than 150 lb. of fruit per tree. Nearly 9,000 acres of apples, pears, and plums are under cultivation in the bitterly cold Kranoyarsk region, and another 3,000 acres are being grown in the Minusinsk district.

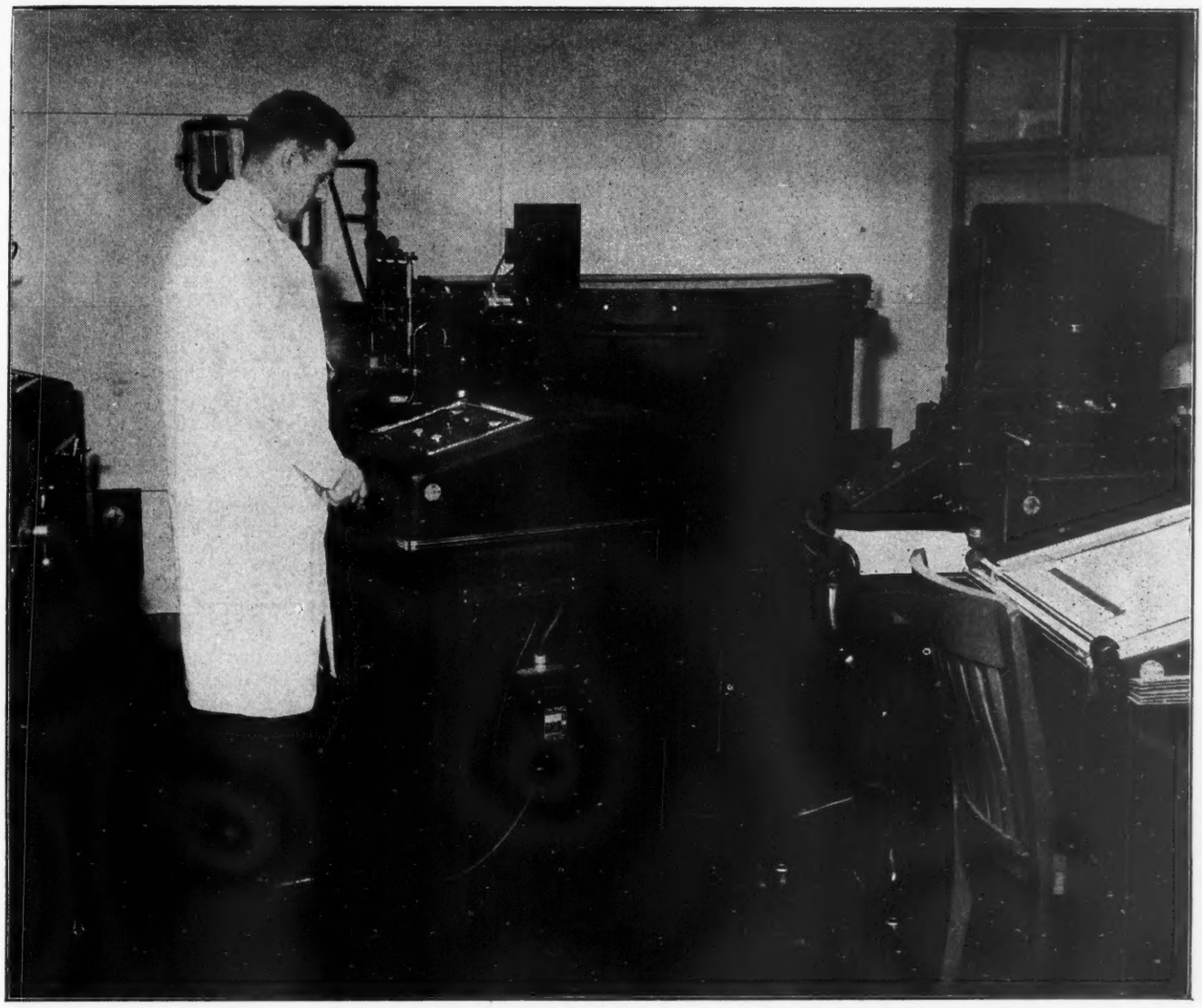
In view of the success of the Siberian experiments, Soviet food experts are now planning further tests with "creeping trees" on the Black Sea Coast to find out if tropical fruit can be grown in that climate. Although it is warm in this region, it is not warm enough for them to mature under ordinary conditions. It is the Kiziurin theory that the warmest air is that closest to the earth, and that most should be made of the layer of warm air in growing produce.

### Claim Huge Increase If Clams Were Nursed

THE yield of U. S. clam fisheries, whose current annual production of more than 30,000,000 lb. comes almost wholly from uncultivated grounds, could be nearly doubled if scientific methods of cultivation were applied in opening up new resources.

This claim is made by biologists of the Interior Department's Fish and Wildlife Service, who believe that cultivation of soft clams may be undertaken successfully in almost any protected area north of New Jersey. They hold that many beds, which at present are almost barren, or entirely devoid of soft clams, could be converted with comparatively little effort into profitable farms. Likewise the cultivation of hard shell clams, which are found from Maine to Florida, is held feasible provided some fundamental rules are observed in selection of grounds and their maintenance.

The possibilities for clam farming



# The machine that looks inside steel for you

**Quite a machine,** this spectrograph at American Can laboratories at Maywood, Illinois.

First, the steel is heated in a high-energy electrical discharge until it gives off light.

Then it resolves this light into its component parts.

**Finally it takes** a picture of these component parts on photographic film. This is called the spectrum of the sample. This spectrum is just as characteristic of the steel as an individual's fingerprints. It actually reveals the composition of the steel.

### So then what?

Well, American Can scientists evaluate the spectrum and determine at once whether the sample meets established specifications.

**Spectrographic analysis** like this is an important part of American Can's quality control. Its purpose? To assure our customers that the steel in their containers will have the corrosion resistance it needs to do their specific container job.

Quality control in steel, thickness of tin plate, solder, sealing compounds, enamel, and all the countless steps in can manufacture are but a part of American Can's service to its customers.

**There is marketing research,** the design of lithographed labels, processing help—to mention only a few more services. Why not ask our representative for further details? Or write:

**AMERICAN CAN COMPANY** CANCO New York • Chicago • San Francisco

**WORLD'S LARGEST MANUFACTURERS OF FIBRE AND METAL CONTAINERS**

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To make your product the finest possible is your natural objective — but sometimes this effort must be limited by the demands of profitable operation.

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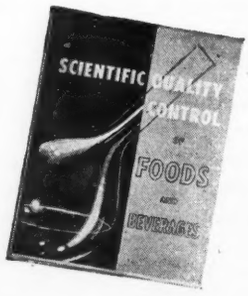
A typical Schwarz procedure might include an analysis of your product in calories, vitamins and minerals to discover what potential value may be lost in processing. A subsequent survey would determine if a change in raw material selection or processing — or, if necessary, fortification — would result in a definite improvement in product quality.

Write today for the new, 20 page Schwarz bulletin *"Scientific Quality Control of Foods and Beverages"* prepared for food and beverage plant executives, chemists and engineers.

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LABORATORIES, INC.

*Wide World*

**BIG CELERY CROP**

**The biggest winter celery crop in 30 years rewarded Florida's growers this year, as the harvesting of 11,000 acres got into full swing. Here, one of the hundreds of pickers diligently applies the taste test.**

are drawn to the attention of returning veterans in particular. Hard clam farms, under cultivation, are reported to yield as much as 600 bu. of 2½-in. clams per acre annually. At current prices, this represents an income of $1,800 to $2,400 per acre of cultivated bottom annually.

It is pointed out that biologists of the Federal Fish and Wild Life Service as well as the fishery authorities of the various states are well versed on the principles of successful cultivation and consequently are in a position to foster its development.

## Study Vitamin A

THE amount of carotene pigments, sources of Vitamin A, in various plant foods has been under study at Punjab University, in India, for some time. Examination of samples of locally grown corn revealed eight different pigments in various proportions but only 31 to 42 percent of the total pigments were found to contain vitamin A.

## Oyster Mortality

A HIGH OYSTER mortality rate in upper Chesapeake Bay can be attributed to the salinity of the water being only one-half to one-third of normal, according to the report of a joint survey made by the Federal Government and the State of Maryland.

The survey, which covered 44 major oyster bars in a 100-sq. mi. section of the upper bay, revealed a mortality rate as high as 75 percent in some places. The condition is

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## "MORE FORD TRUCKS ON THE ROAD" MEANS MORE FOOD ON MORE TABLES!

*"The three Ford 1½-ton units in our fleet have proved very satisfactory,"* writes Mr. R. W. Dennett, of Dugdale Packing Company, St. Joseph, Mo. *"The cost of maintenance has been nominal."*

Packers and other food producers and distributors by hundreds have written enthusiastic letters about the way their Ford Truck fleets have performed through the tough years just past. Ford economy, reliability and easy maintenance, as well as the consistent availability of competent Ford service, have played a big part in America's notable achievements in sustained maximum food production.

The new Ford Trucks are the best in Ford history. They bring you 32 important engineering advancements designed to save you money on gas, oil and maintenance and to last longer. That's why we say: "More Ford Trucks on the road means more food on more tables." See your Ford Dealer now!

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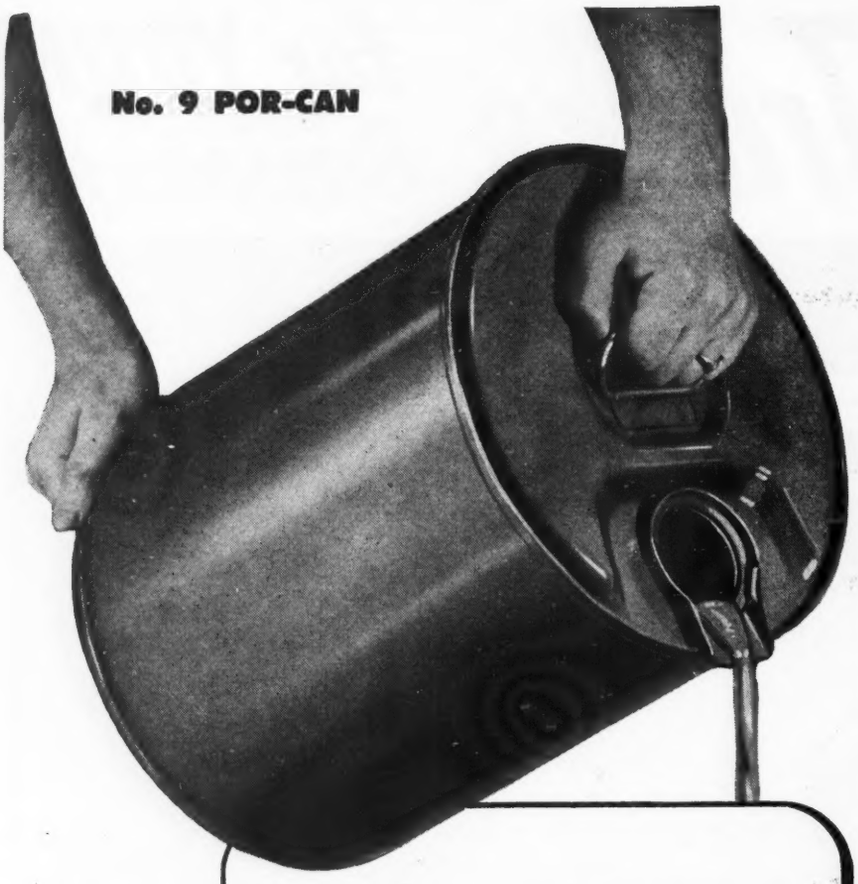
**THE FAMOUS V-8 ENGINE, for toughest service, now 100 HP, with NEW steel-cored Silvaloy rod bearings for trebled endurance • NEW Flightlight aluminum alloy 4-ring pistons for added oil economy • Tougher, rust-proofed valve springs • NEW moisture-sealed distributor • NEW coolant-saving radiator closure • Auto-balanced carburetion for still more thrifty power • Servicing simplified still further. And the rugged, thrifty 90 HP Ford six-cylinder engine, for stop-and-go jobs, with many important advancements, available in all except C.O.E. chassis.**

**Ford Truck rear axles—world-famous for load-lugging—provide generous reserve capacity • Light duty chassis have sturdy ¾-floating axle with triple-roller-bearing, straddle-mounted pinion; full-floating axles in all other chassis • 2-speed axle at extra cost in heavy duty units • Improved 4-speed transmission at extra cost in light duty chassis, standard in all others.**

# FORD TRUCKS

**MORE FORD TRUCKS ON THE ROAD • ON MORE JOBS • FOR MORE GOOD REASONS**




EASY TO POUR

These Por-Cans are particularly designed for packaging thin liquids. The seamed on heads and electric lap-weld construction provides unusual strength and guarantees against leakage.

The tight-sealed, easy pouring spout makes this container ideal for any liquid product.

**PUSH-PULL SPOUT** No. 594LPV has the same basic construction as the Swivel-Spout can, but the tube spout has advantages in handling some liquids.

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reported as not extending to the south and more normal salinity is expected in the affected area unless the Susquehanna River has an unusually heavy run off.

## Alaska Salmon Outlook Dark for Coming Year

IF the cycle theory of salmon runs means anything, the 1946 outlook for Alaskan canned salmon production is somewhat bleak. Only a small or moderate-sized pack of red salmon is expected in Bristol Bay and the same is true for pink salmon in southeastern Alaska.

Government representatives are reported figuring on a total American salmon pack in Alaska, Puget Sound and Columbia River of only about 5,500,000 cases. One bright spot in the picture is that the sockeye run on Puget Sound and in the Fraser River is supposed to be good because the escapement of this four-year cycle going back to 1942 was good. Since pinks are on a two-year cycle ending in uneven numbered years, they will not appear on Puget Sound this year.

## Herring Oil

NORWEGIAN FISH canning plants are hoping to boost their production despite lack of olive oil through use of specially refined herring oil, which it is claimed, closely approaches olive oil in taste.

Whereas olive oil imports exceeded 3,000 tons annually, prewar, none has been received since liberation. Only 67,500 cases of sardines have been exported since liberation.

## SCHEDULE OF EVENTS

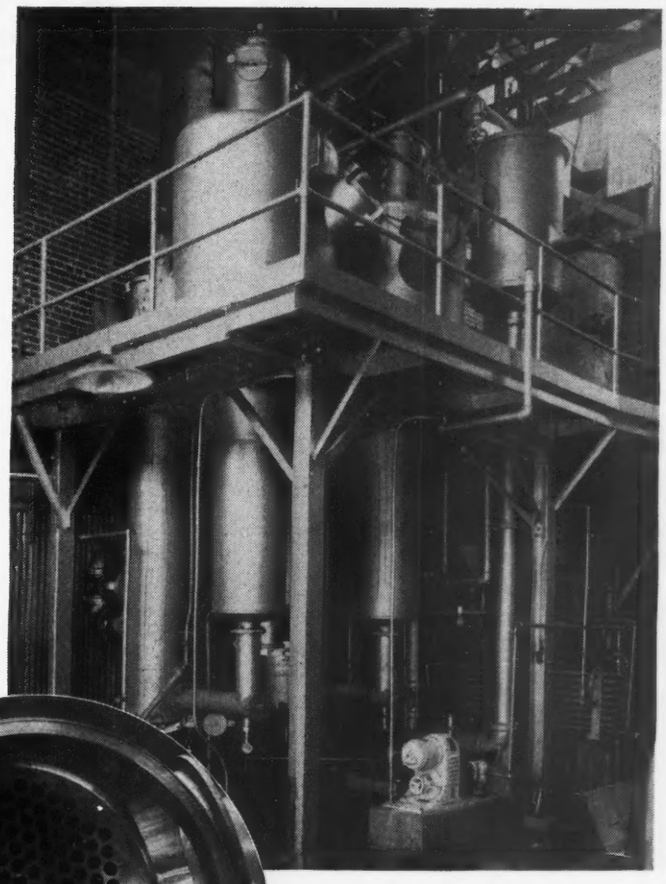
MAY

6- 9—American Society of Brewing Chemists, annual meeting, Pfister Hotel, Milwaukee, Wis.
13-15—Millers National Federation, annual conference, Edgewater Beach Hotel, Chicago.
13-16—American Association of Cereal Chemists, 31st annual meeting, General Brock Hotel, Niagara Falls, Ont., Canada.
15-17—American Oil Chemists Society, 37th annual meeting, Roosevelt Hotel, New Orleans, La.
21-24—Society of American Bacteriologists, 46th annual meeting, Book-Cadillac Hotel, Detroit.
26-29—National Peanut Council, national convention, Cavalier Hotel, Virginia Beach, Va.

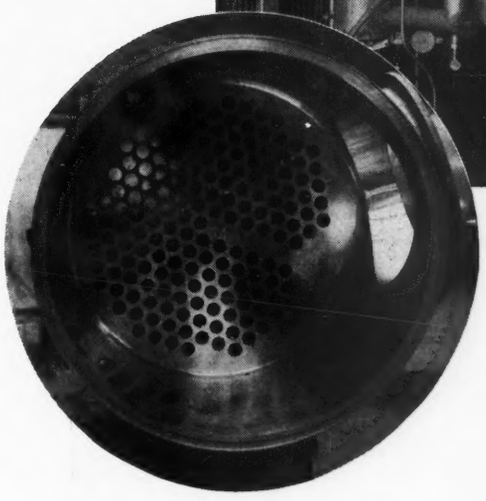
JUNE

1-30—June Dairy Month.
2- 4—Flavoring Extract Manufacturers Association of the U. S., annual convention, Drake Hotel, Chicago.
17-18—Mayonnaise and Salad Dressing Manufacturers Association, annual convention, Palmer House, Chicago.
17-19—Grocery Manufacturers of America, mid-year meeting, Shawnee Inn, Shawnee-on-the-Delaware, Pa.
20—National Pickle Packers Association, mid-year meeting, Bismarck Hotel, Chicago.
24-27—National Confectioners' Association, 63d annual convention and 20th confectionery industries exposition, Stevens Hotel, Chicago.

# TO PRESERVE THE DELICATE QUALITY OF YOUR PRODUCT



A BUFLOVAK Double Effect Stainless Steel Food Product Evaporator installation.



The upper chamber and heating tubes of a BUFLOVAK Stainless Steel Food Product Evaporator, showing the complete accessibility for cleaning when the hinged cover is swung open.

## *Buflovak* EVAPORATORS FOR FOOD PRODUCTS

BUFLOVAK Food Product Evaporators are carefully designed to assure the correct operating conditions that preserve the delicate quality of your product.

The natural flavor and color of your product is retained in the finished product because evaporation is practically instantaneous. The liquid passes rapidly over the heating surfaces and is quickly discharged, in continuous operation, as a high quality finished product.

Substantial savings result in several ways. Upward of 99.9% of all solids are recovered. 50% in steam and cooling water is saved with the Double Effect Evaporators.

BUFLOVAK Food Product Evaporators are built in stainless steel, in sizes and types to meet your product and operating requirements.

Besides Evaporators, BUFLOVAK build Atmospheric and Vacuum Dryers, Solid Recovery and Distillation Equipment, Processing Kettles and Sterilizers.

Complete information will be sent prompty.

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# INDICATORS

### Production

**Flour** production dropped more than 1,600,000 sacks in March, as compared with February, according to the *Northwestern Miller*. The output, representing 73 percent of the total, came to 14,536,791 sacks, against 16,189,015 for February and 15,538,353 for March, 1945.

**Creamery butter** production, in February, estimated at 66,625,000 lb., was the lowest in 21 years. It was 28 percent less than in February a year ago and 45 percent lower than the five-year average. The output was also 2,370,000 lb. lower than the previous month.

**Milk** production was 8,300,000,000 lb. in February, 2 percent less than a year ago, but 9 percent above the 1935-44 average. On a daily basis, milk production was 7 percent higher than in January.

**American cheese** production, in February, was the smallest for that month since 1941. Estimated at 44,485,000 lb., it was about the same as January, but 14 percent less than in February, 1945, and 2 percent less than the 1940-44 average. About 95 percent of the total production was Cheddar cheese and the remainder other American types made with whole milk.

**Frozen vegetables** and frozen fruits continued to climb in 1945, according to the National Association of Frozen Food Packers. Frozen vegetables packed reached a total of 307,977,000 lb., as against 237,093,000 lb. packed in 1944. The total for frozen fruits and berries came to 427,038,000 lb., compared with 323,885,000 lb. in 1944.

**Cuban sugar** production for 1946 has been revised upward by 300,000 tons or more, as a result of recent crop surveys. The original estimates were for 4,500,000 tons, while the revised figures indicate 4,800,000 to 5,000,000 tons.

**Reduced bookings** of chicks for delivery, during April and May indicate a much lighter hatch this year than last. A recent government survey in the country's eight geographic divisions showed a reduction ranging from 2 to 48 percent, with a total for the country of about 25 percent less than in the same months in 1945. It is the number of chicks hatched after April 1 that determines the extent of the year's hatch, the output during the first three months varying little from year to year.

**Citrus** production this season will reach a record high, of about 187,000,000 boxes, 5 percent above the 1944-45 total and 50 percent above the 1934-43 average. Total orange production is estimated at 105,500,000 boxes, a little below the record high of last year. Grapefruit, however, is estimated at a new high of 62,800,000 boxes, as against last season's 52,100,000. These increases are being contributed by Florida, Texas and Arizona, the California orange crop being estimated at about 18 percent below last year, while the grapefruit output will drop about 7 percent. Lemons, however, will show about a 12 percent increase in California.

### In Storage

**Holdings** of frozen fish and shellfish dropped only 16,000,000 lb. during February, and on March 1 totaled 99,050,594 lb., 72 percent above average. This compares with holdings of 52,965,333 lb. on Mar. 1, 1945. It was estimated that holdings on April 1 were between 75- and 80,000,000 lb.

**Canned peas** for civilians in canners hands on March 1, were equivalent to 3,748,000 cases, No. 2 basis, according to the National Canners Association. On the same date last year, stocks were 1,900,000 cases.

**Canned tomato** juice civilian stocks were estimated at 3,403,000 No. 2 cases, on March 1, by the National Canners Association. This compares with 5,273,000 cases on February 1, and 3,406,000 cases on Mar. 1, 1945.

**Sweet corn** for civilians, in canners hands on March 1, totaled 4,315,000 cases No. 2's, as compiled by the National Canners Association. A year ago the total was 2,723,000.

### Indexes

**Wholesale price** index of foods, compiled by the *New York Journal of Commerce*, stood at 114.6 for the week ending April 13, which compares with 113.3 for the corresponding week a month earlier, and 108.8 for April, 1945.

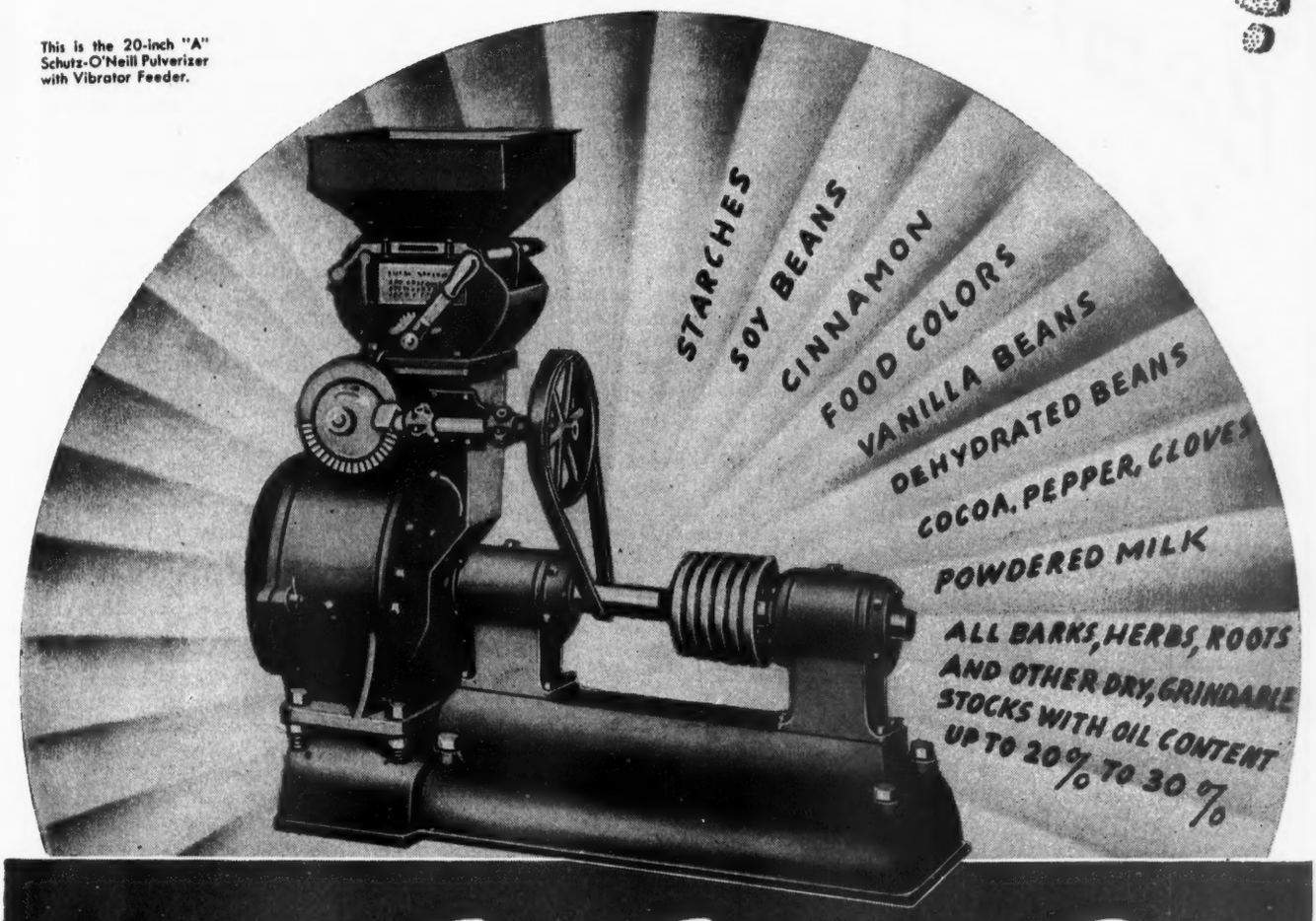
**Business Week's** business activity index for the week ending April 6 showed 172.0. This compares with 158.0 a month ago and 231.3 a year ago.

# CONSTRUCTION NEWS

| | Pending (thousands) | Awarded April (thousands) | Total Awarded 1946 (thousands) |
|---|---|---|---|
| Bakery | .... | $ 484 | $ 2,475 |
| Beverages | $2,165 | 3,520 | 15,867 |
| Canning and Preserving | 400 | 650 | 3,903 |
| Cold Storage | 160 | 1,520 | 4,923 |
| Confectionery | .... | .... | 355 |
| Grain Mill Products | 985 | 655 | 4,603 |
| Ice, Manufactured | 100 | 90 | 905 |
| Meats and Meat Products | 190 | 600 | 755 |
| Milk Products | 1,495 | 360 | 5,042 |
| Miscellaneous | 1,670 | 576 | 8,644 |
| | $7,165 | $8,455 | $47,472 |

# WHAT DO YOU PULVERIZE?

This is the 20-inch "A" Schutz-O'Neill Pulverizer with Vibrator Feeder.

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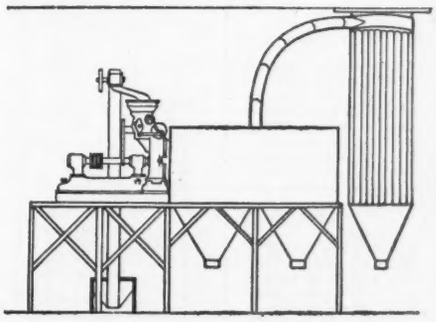
## with the SCHUTZ-O'NEILL PULVERIZER

The Schutz-O'Neill Pulverizer is a centrifugal air force impact pulverizer for continuous or batch operation. For extremely fine grinding and uniformity, the principle of centrifugal impact when carried by the air stream has never been surpassed. The product is floated off on air —there is no screen to clog or wear out. Thousands of Schutz-O'Neill Pulverizers have proven their sturdiness, long life, low power consumption, high output and ease of operation. With a range of sizes in several styles, any dry, grindable stock can be efficiently pulverized.

**CONSULT US ON YOUR PULVERIZING PROBLEMS.** Write us your requirements, products to be pulverized, output desired, and send a sample. This in no way obligates you. Literature sent on request.



MILL PLAN No. 40 shows pulverizer with horizontal discharge directly into receiving chamber. One of many possible set-ups.

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**NO LAUNDERING**
Save their cost over and over again!

**TOPMOST PROTECTION**
Far greater safeguard to clothing than ordinary aprons!

**AMAZING STRENGTH**
Plus lightness in weight for utmost wearing comfort.

**6 COLORS — 4 SIZES**
**PRICES — SIZES — COLORS**

WHITE—Light Weight
27 x 36..$ 6.88 per doz.
30 x 36.. 7.65 per doz.
36 x 40.. 9.35 per doz.
36 x 44.. 10.18 per doz.
Full Length Sleeves $7.15 per doz. pair

BLACK—Light Weight
30 x 36.. 9.78 per doz.
30 x 36.. 9.75 per doz.
36 x 40.. 11.90 per doz.
36 x 44.. 12.60 per doz.
Full Length Sleeves $9.66 per doz. pair
Leggings, Hip Length $11.90 per dozen pair

GRAY—Medium Weight
27 x 36..$ 8.40 per doz.
30 x 36.. 9.78 per doz.
36 x 40.. 11.90 per doz.
36 x 44.. 12.60 per doz.
Full Length Sleeves $9.66 per doz. pairs
Leggings, Hip Length $11.90 per doz. pair

MAROON—Heavy Double Coated Neoprene
27 x 36..$10.61 per doz.
30 x 36.. 12.60 per doz.
36 x 40.. 16.50 per doz.
36 x 44.. 18.74 per doz.
Full Length Sleeves $12.90 per doz. pair
Leggings, Hip Length $23.50 per doz. pair

BLACK—Heavy Double Coated Neoprene
27 x 36..$10.61 per doz.
30 x 36.. 12.60 per doz.
36 x 40.. 16.50 per doz.
27 x 36..$ 8.40 per doz.
Full Length Sleeves $12.90 per doz. pair
Leggings, Hip Length $23.50 per doz. pair

WHITE—Extra Heavy 20 Mill Plastic
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30 x 36.. 14.00 per doz.
36 x 40.. 18.33 per doz.
36 x 45.. 20.50 per doz.
Full Length Sleeves $12.90 per doz. pair
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# What Washington Thinks

By R. S. McBRIDE, Washington, D. C.

**POLLUTION CONTROL**—First important step toward enactment of a Federal law for further control of pollution of interstate waterways was taken by the House of Representatives in reporting favorably a new bill, H. R. 6024. If enacted, this bill would provide extensive Federal regulation of waterways, including some drastic provisions for "standards of cleanliness." Even if some much less drastic measure becomes law, food technologists are going to have to use their best skill, and quite a lot of money, to be sure that their companies do not get into difficulty with illegal effluent from their food factories.

**BOOM IS ON**—Present industrial demand for many chemical and mineral raw materials exceeds that of the peak of wartime activities. The resulting boom in manufacturing means good wages, steady employment, and high national income. The result will be continued demand for high quality manufactured foods, even at the expense of some low-cost food materials.

**FOOD SUBSIDIES**—There is no need for comment on the following interpretation from the Chamber of Commerce of the U. S.: "Federal subsidies on food products will total $4.8 billion for the three-year period ending June 30. Their continuance another year, as is now advocated by government officials, will require $1.75 billion additional, according to official estimates, thus bringing the total expenditure for food subsidies to $6.55 billion. This shows the growth of a program which won support at the beginning on the strength of the claim that a subsidy program would be a comparatively inexpensive means of stabilizing prices."

**NO MINERAL OIL**—Again Food and Drug Administration admonishes inquirers that "Mineral oil is wholly without food value. Its substitution for food oils in common foods has always been regarded as an adulteration under any form of labeling." The only rare exception recognized is the use of such non-nutritive ingredient in a few special dietary foods, which then must meet very special provisions as to formula, label, and use. Mineral oil salad dressings hitherto permitted will no longer qualify for such special exception as "dietary foods."

**FOOD STANDARDS** — Announcement by F&DA in April of proposed new standards for canned wax and green beans is further indication that the food standards work is soon to resume activity comparable with prewar days. This particular series of hearings will include a discussion of quality standards, quite an undertaking for any canned vegetable. Those interested in other commodities that may be scheduled for identity or quality standards later would do well to make their plans now. When formal announcement comes it's too late to do more than refresh one's self on the details.

**A VOTE FOR SANTA**—Washington during an election year reminds one of the old pioneer adage, "The only good Indian is a dead Indian." Congressmen practice this idea in the form, "The only good vote is a Santa Claus vote." Any evidence of a stand taken on a controversial question is to be avoided during an election year, according to this theory. The only questions that are not controversial, or so it seems, are those in which the members of Congress vote to give free service, special aid, subsidy, or other gratuity to the members of some pressure group. Meantime, all controversial legislation, even that vital for national defense and international amity, is bottled up in committees or remains on the calendar as long as possible without a vote.

**ONE FRAGMENT**—A single insect fragment or other microscopic evidence of food contamination can condemn a whole car load of goods. This extreme view is, of course, not literally enforced by Food and Drug Administration. But the rightfully rigorous effort to keep filth out of food is producing one very unfortunate secondary problem, which

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DIRECTOR OF CIRCULATION, FOOD INDUSTRIES
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official and industrial food technologists must face more effectively soon. That is the question of how to prevent the presence of any single insect fragment in a big truck load of fresh corn or in a thousand cases of other vegetables. No one can legitimately argue that such minute contamination is excusable. But the actual waste of valuable food for processing, because of the inability to get rid of the last trace of insect pest, continues as one of the outstanding technologic jobs of the canner, freezer, and dehydrator.

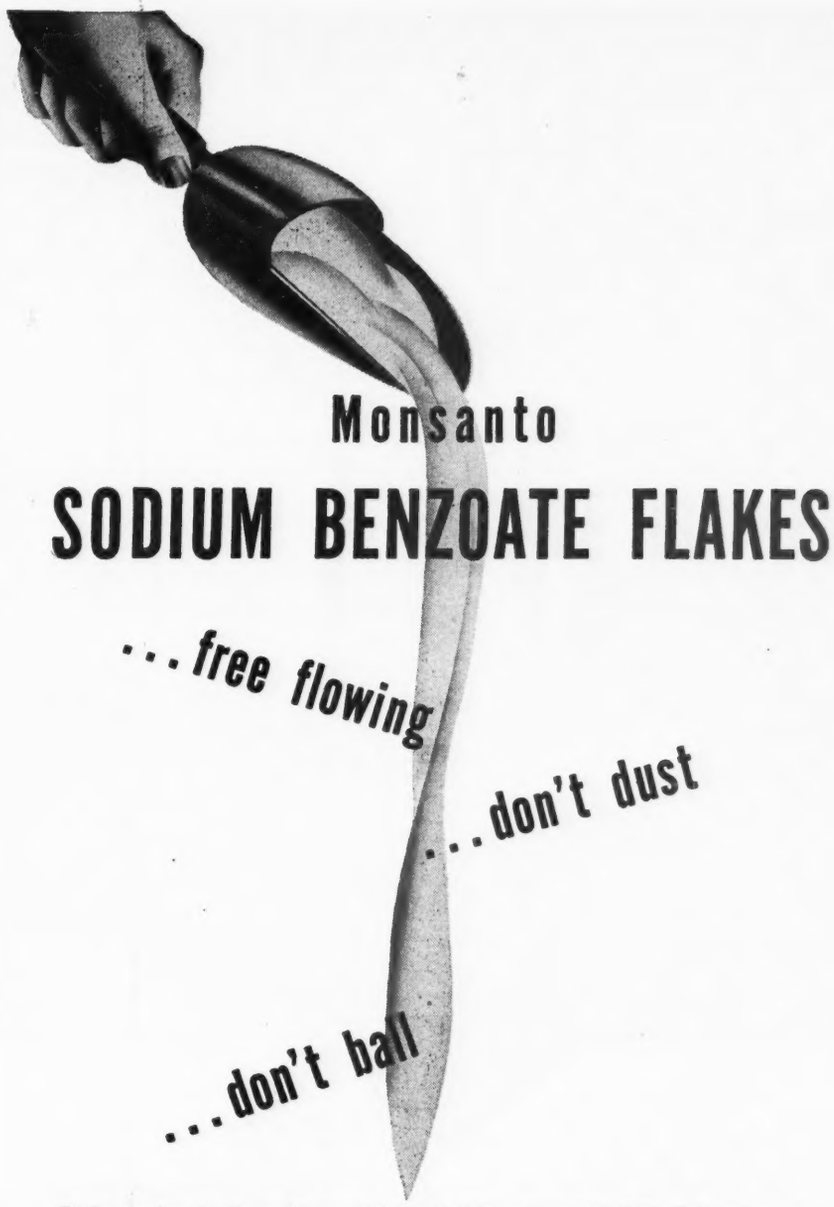
**MINIMUM WAGE**—No one knows what Congress is going to do this Spring about the minimum wage law, as this paragraph is written. But it takes no crystal gazer to recognize that within a short time, certainly soon after election if not before, Congress intends to follow the dictum of reformers and organized labor in raising the minimum permissible wage rate by a considerable amount above the present 40-cent limit. The question is not whether there will be such raise. It is whether the raise will be to 60 cents, 65 cents, or even higher for the early future. Estimates of food plant costs might as well take account of this problem now. And one of the ways in which it will legitimately be interpreted is to increase the desirability of further mechanization and thus to reduce direct labor costs.

**CONSTRUCTION LAGS**—Building and modernization of food plants are being seriously interfered with by the interpretations of the Veterans' Housing Order. Washington knows that this is bad, but the negative attitude prevails, even in offices that are managed by officials with the best intentions. It is so much easier to say "No" with a virtuous-sounding but ineffective apology.

**WAR MARKET HELD**—Official reports indicate that the total sales of canned poultry have not changed much since the end of the war. But the distribution has, because very little now goes to the military services. Agricultural officials wonder whether other food processors are going to be so successful in holding their wartime gains in market.

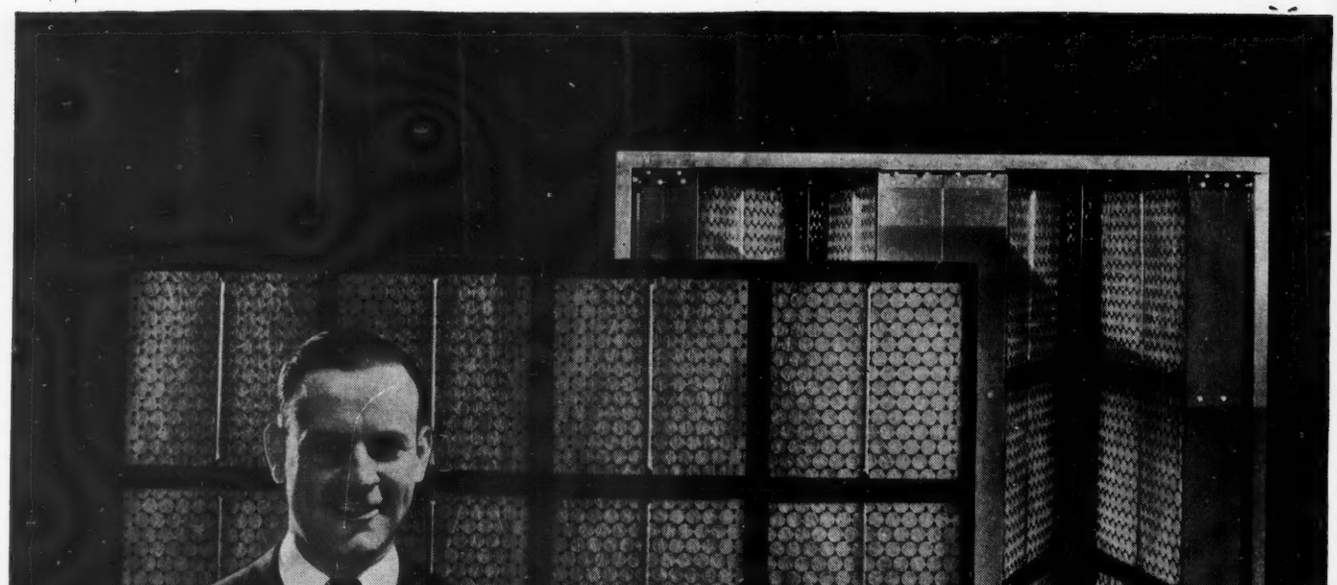
**REPEAL IMPOSSIBLE**—Congress continues valiantly in the effort to repeal the law of supply and demand. But despite that effort it is found that this is just as much a natural law as the law of gravity. When folks want something badly they will pay for it, almost regardless of price, which means that OPA can not stop black markets any better than the Prohibition Bureau did.

**RESALE PRICES** — Federal Trade Commission has issued a new report on resale price maintenance, a document of nearly 900 pages. In so reporting to Congress, FTC apparently gives notice that it intends to go out and further participate in price rulings, even using its influence in state transactions where, of course, it has no authority.


It is easier to handle and blend Monsanto Sodium Benzoate, U.S.P., in flake form. Unlike powder, Monsanto Sodium Benzoate flakes flow more freely—do not dust and cause annoyance to operators—do not ball when mixing. Ask for samples of Monsanto Sodium Benzoate, U.S.P., in flake and powder form. Try both, and see why flakes are preferred . . . Contact the nearest Monsanto Office, or write: MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri. District Offices: New York, Chicago, Boston, Detroit, Cincinnati, Charlotte, Birmingham, Los Angeles, San Francisco, Seattle, Montreal, Toronto.

MONSANTO CHEMICALS
SERVING INDUSTRY...WHICH SERVES MANKIND



# "How much is FILTERED AIR worth?"

Air filtering, in many production processes, frequently makes the difference between profit and loss—between inspection approvals and rejects. Then air filters are "worth their weight in gold". Yet by using DUST-STOPS*, the advantages of filtered air can be obtained at both low initial and low maintenance cost.

The DUST-STOP is a replaceable-type air filter in which packs of adhesive-coated FIBERGLAS fibers provide an efficient medium for catching and holding most atmospheric and manufactured dusts.

DUST-STOP Air Filters are readily adaptable to the smallest or largest heating, ventilating or air-conditioning system—may be installed in custom-built or the complete, ready-to-assemble DUST-STOP steel frame cells that can be built up into filter banks *to handle any c.f.m. of air required.*

Once the filter bank is installed, maintenance is easy and economical—for replacement DUST-STOPS are readily available from authorized suppliers in every community.

Complete information on DUST-STOP Air Filters will be sent on request—See Sweet's Files for typical installation details or write: Owens-Corning Fiberglas Corp., Dept. 2009, Toledo 1, Ohio. Branches in principal cities.

*In Canada. Fiberglas Canada Ltd., Oshawa, Ontario.*

**DUSTOP** **AIR FILTERS**

*T. M. Reg. U. S. Pat. Off.

**—a FIBERGLAS product**

# MEN • JOBS • COMPANIES

## INDUSTRY

**Bowman Dairy Co.**, Chicago, was given a citation by the Air Services Placement Center for outstanding interest and cooperation in placing men returning from the air services.

**California Packing Corp.** plans a $200,000 remodeling and renovating program at its main packing plant in Fresno, Calif.

**California Vegetable Concentrates, Inc.**, Huntington Park, Calif., has purchased Couture Farms' dehydration plant at Modesto, Calif. New equipment is being installed to process celery, tomatoes and peppers. Carrots will continue to be the main product.

**Carmel Canning Co.**, Monterey, Calif., was damaged by an explosion and fire to the extent of $60,000. The company cans sardines.

**Carnation Co.** has purchased all the operating facilities of Morning Milk Co., Salt Lake City. Acquisition includes plants at Wellsville, Utah and Sunnyside, Wash.

**Great Lakes Sugar Co.**, Findlay, Ohio, is spending $250,000 on extensive improvements to its plant. Annual production of the plant is 27,000,000 lb. of beet sugar.

**Igleheart Brothers, Inc.**, a unit of General Foods Corp., has started construction of an 800,000-bu. grain elevator at Pendleton, Ore. The new unit is scheduled for completion by July 1.

**Inland Empire Frozen Foods Co.**, Pendleton, Ore., has completed construction of a $175,000 quick freeze plant. The company will process peas, corn, asparagus, spinach, apples, prunes and peaches. Milan Smith is president of the firm.

**Karsten and Sons**, Chicago, has begun construction of a $500,000 chicken canning plant to be completed about September 1.

**Kitchen Art Foods, Inc.**, Chicago, has been purchased by Louis Weinberg, Jr., former merchandising executive for United Biscuit Co.

**Libby, McNeill and Libby, Inc.** has a 25 percent interest in a $2,000,000 Mexican corporation, which has taken over the fruit and vegetable canning plant of Quintana and Co. Libby technicians will be responsible for the reorganization of the plant as well as the introduction of the latest developments in canning practices.

**New Carlisle Canning Co.**, New Carlisle, Ohio, has been sold to Beckman and Gast Canning Co., Minster, Ohio. The plant had been canning tomatoes.

**Sperry Division of General Mills, Inc.**, plans to construct a 6-story cereal manufacturing plant at Lodi, Calif.

**Standard Brands** plans to build a $625,000 laboratory in New York.

**Zion Industries, Inc.**, Zion, Ill., plans to construct a 3-story addition to its candy factory and 2-story annex to the bakery.

## PERSONNEL

**G. O. Bailey**, who has been vice-president in charge of production for Birds Eye-Snider, Inc., recently was made staff vice-president. J. E. Guinane, former production manager, moves up to the post vacated by Mr. Bailey.

**Lawrence H. Barrett**, formerly vice-president, has been elected president of the Hydrox Corp., Chicago. Karl D. Franke is the new vice-president and Raymond J. May is secretary.

**W. D. TERMOHLEN**

**Having been in the U. S. Department of Agriculture since 1933, W. D. Termohlen recently was appointed director of the Poultry Branch of the Production and Marketing Administration of the Department of Agriculture.**

**FRANK ARMOUR, JR.**

**Recently appointed manager of operations for the manufacturing division of H. J. Heinz Co., Frank Armour, Jr., moves up a notch in the food company he has been with for the past 19 years.**

**COL. CHARLES S. LAWRENCE**

**The Quartermaster Subsistence Research and Development Laboratory has been redesignated as the Quartermaster Food and Container Institute. Colonel Lawrence replaces Col. Rohland A. Isker as commanding officer of the agency.**

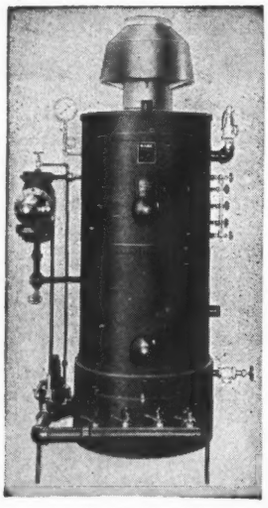
**WALTER BYRD**

**Standard Brands, Inc., New York, has announced the appointment of Walter Byrd as packaging engineer. Mr. Byrd formerly was chief packaging engineer for Johnson and Johnson, New Brunswick, N. J., manufacturers of pharmaceuticals.**

LEADER FOR 50 YEARS

JAMISON-
BUILT COLD STORAGE DOORS
HAGERSTOWN, MARYLAND

BRANCHES IN PRINCIPAL CITIES



KANE Boiler

## A PRACTICAL COMBINATION

Not all food processing plants have the same requirements so your best bet is *Engineered Steam*:—a combination of the KANE *boiler;* the controls; the MKO automatic *boiler feed,*—plus the *experience* to judge the equipment best suited to your particular requirement.

It insures clean steam with precise temperature control.

The modern KANE, built in sizes up to 30 H.P., is an automatic, gas-fired steam boiler with design and construction soundly based on experience gained during forty years of boiler building.

Condensate Return System. Automatically returns hot condensate and adds needed make-up water.

Compliance with A.S.M.E. standards and the ability to withstand hard usage, make the KANE boiler an excellent long term investment.

Under present conditions we can't keep pace with the demand for *Engineered Steam,* but we will try to fill your most urgent needs as soon as possible.

MEARS KANE OFFICE
Manufacturers of Automatic Steam Boilers for over a third of a century
1903-1915 EAST HAGERT STREET PHILADELPHIA

**Melvin Bishop,** recently with the U. S. Quartermaster Corps, has been named head of the field contracting and fresh produce purchasing department of Deerfield Packing Corp., Seabrook Farms, N. J.

**Theodore E. Carl,** formerly production manager for Pleasant Valley Wine Co., Rheims, N. Y., is now in charge of production at R. C. Williams Co. Winery, Penn Yan, N. Y.

**D. T. Carlson,** Willmar, Minn., has been reelected president of the American Dairy Association, Chicago. Robert Prior, Seattle, is vice-president and Bryce S. Landt, Wisconsin Dells, Wis., treasurer.

**Cliff D. Carpenter** recently was elected president of the Institute of American Poultry Industries, Chicago.

**J. B. Cella II** has been named vice-president of Cella Vineyards, Fresno, Calif., where, with his father, he will manage the Cella extensive grape and wine interests and winery. Prior to his entry into the armed services, he had been a purchasing agent for the Rome Wine Co.

**Francis R. Dalton** has been elected president of Superior Fish, Ltd., and Superior Fillets, Inc. Mr. Dalton formerly was connected with the Great Atlantic and Pacific Tea Co. and was active in the installation of the company's first fish fillet production line.

**Nelson H. Eddy** has been appointed to the directorship of the newly established department of economic research for The Best Foods, Inc.

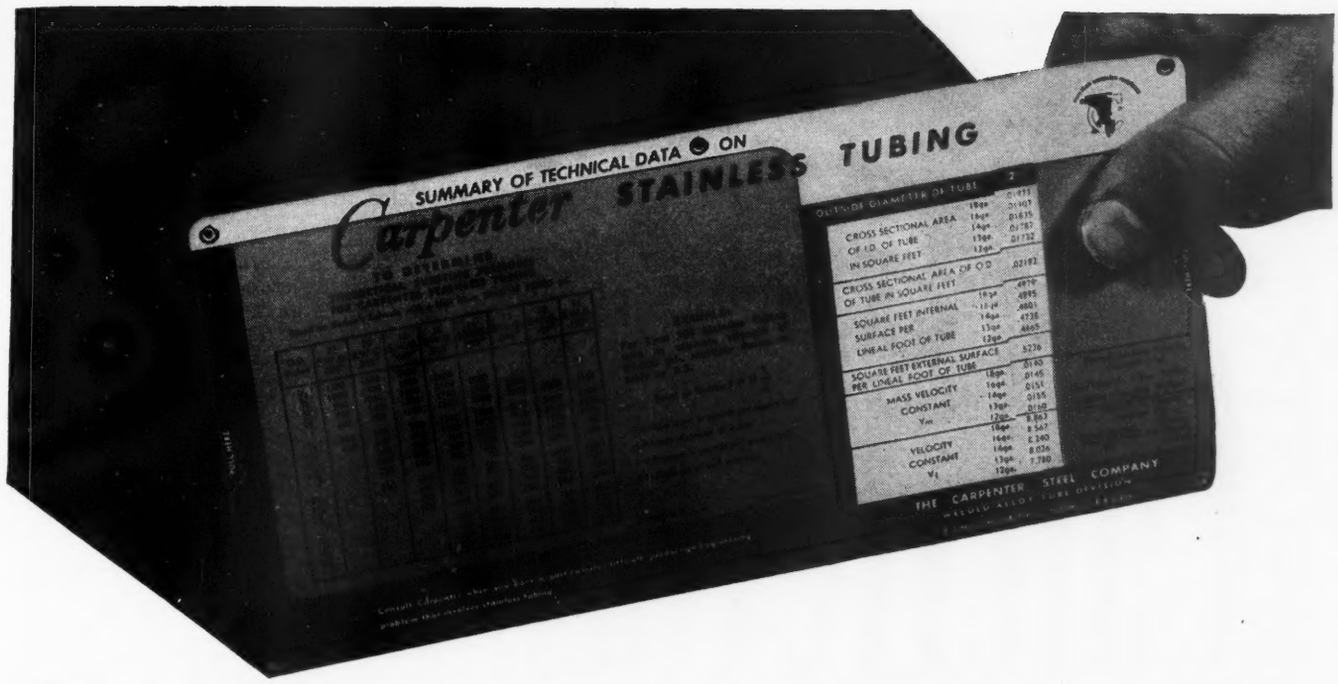
**George W. Foster** has been named vice-president of the Stokely-Van Camp Export Corp., and will head the new Stokely export subsidiary from offices in Washington. The export division also will maintain offices in Indianapolis, Ind. and Oakland, Calif.

**R. C. Johnson** has accepted an appointment as research engineer at Southern Research Institute, Birmingham, Ala.

**John W. Ladd,** president of Cherry-Burrell Corp., has been elected a member of the board of directors of the National Dairy Council, filling the vacancy caused by the recent death of Walter L. Cherry.

**Fred J. Madel,** for 10 years vice-president in charge of sales for the Borden Farm Products Co., Detroit, was recently appointed company president, succeeding A. M. Heyboer, retired after 32 years of service. Ray P. Brickley succeeds Mr. Madel.

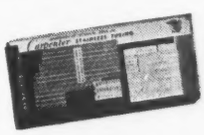
**Capt. R. R. Mickus,** formerly with the Cereal Products Division of the Quartermaster Subsistence Research and Development Laboratory, Chicago, is now consultant to the Harry B. Williams Co., Chicago.




# *New* Easy-to-Use Stainless Tubing Data

## *At Your Fingertips*

● Never before has this type of information been available in such easy-to-use form. And it is yours for the asking. Just drop us a note on your company letterhead and ask for the Carpenter Stainless Tubing Slide Chart.



Other side of the Carpenter Stainless Tubing Slide Chart gives information on Physical Properties of Stainless Tubing, plus data on sizes and gauges available.

**THE CARPENTER STEEL COMPANY**
**WELDED ALLOY TUBE DIVISION, KENILWORTH, N. J.**

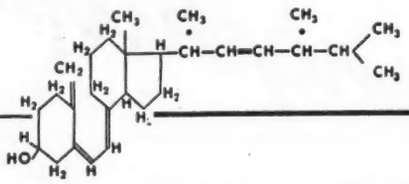
**Carpenter**
**WELDED**
**STAINLESS TUBING**

YOU SHOULD ADOPT

# Calciferol

## (PURE CRYSTALLINE VITAMIN $D_2$)

Calciferol is the name applicable *only to the superior, pure crystalline product* as so recognized and used throughout the world.



**WRITE FOR DETAILS AND NEW LOW PRICE SCHEDULE**

Winthrop's pure crystalline synthetic vitamin $D_2$ (Calciferol) is free from lumisterol, toxisterol, suprasterol, and other by-products of irradiation. It never varies in antirachitic potency.

**OTHER WINTHROP PURE SYNTHETIC VITAMINS:**

- **TRIDEE**—Winthrop's Brand of vitamin $D_3$ in Corn Oil
- **VITAMIN $B_1$** (Thiamine Hydrochloride)
- **VITAMIN $B_2$** (Riboflavin)
- **NIACINAMIDE**
- **VITAMIN $B_6$** (Pyridoxine Hydrochloride)
- **CALCIUM PANTOTHENATE**
- **VITAMIN C** (Ascorbic Acid)
- **AMINO-ACIDS**
  - Valine, Cystine, Tyrosine, Leucine, Glutamic Acid, Tryptophane, Phenylalanine, Methionine
- **"B-E-T-S"**—Winthrop's Brand of Bread-Enrichment Tablets
- **"VEXTRAM"**—Winthrop's Brand of Flour-Enrichment Mixture

**POTENCIES AND PACKINGS:**

Crystalline Form in vials of one, five, and ten grams.

Solution in Corn Oil: 1,000,000 U.S.P. Units per gram* packed as follows:

| | |
|---|---|
| 400 Standard Units | 2,500 Standard Units |
| 1,000 Standard Units | 50,000 Standard Units |

Also Solution in Corn Oil: 400,000 U.S.P. Units per gram packed as follows:

| | |
|---|---|
| 250 Standard Units | 1,000 Standard Units |
| 500 Standard Units | 20,000 Standard Units |

*Standard Unit = 1,000,000 U. S. P. Units

WINTHROP

*For prices and information address*
*Special Markets Division*
**WINTHROP CHEMICAL COMPANY, INC.**
**170 Varick Street, New York 13, N. Y.**

**T. E. Moffitt** has been named sales manager of the Pennsylvania Salt Manufacturing Company of Washington, a subsidiary of the Pennsalt Co., Philadelphia. His headquarters will be in Tacoma, Wash., where he will have charge of all heavy chemical sales activities in the Tacoma and Portland, Ore. plants.

**Richard W. Norcross** has joined Snow Crop Marketers, Inc., as production manager in charge of quality control. He has been a field representative for Birds Eye-Snider, Inc., located in San Jose, Calif. The Snow Crop line of frozen foods will make its first appearance in eastern markets this year.

**Philip W. Pillsbury,** president of Pillsbury Mills, Inc., recently awarded the prize for the best wheat in the nation to Luther F. Givens, Sterling, Colo. Hard red winter wheat was the winner. This is the fourth consecutive year that Colorado has won the prize.

**Lewis E. Russell** has been named vice-president in charge of production, for Pillsbury Mills' Premix division. He was formerly cereal plant manager for Doughnut Corp. of America, at Ellicott City, Md. His headquarters will be at Springfield, Ill.

**Norman F. Steuer,** formerly chief designer for Owens-Illinois Pacific Coast division, recently opened an industrial design office in San Francisco. He will specialize in product and package design.

**Kenneth T. Wood** is constructing a new pickle factory at Bryan, Tex. The one-story concrete building will be completed by May 15.

# DEATHS

**Isaac A. Chase,** 65, one of the founders of Chase Bottling Co., Memphis, Tenn., recently.

**Charles S. Crary,** second president and one of the organizers of the National Canners Association, March 16, in Chicago.

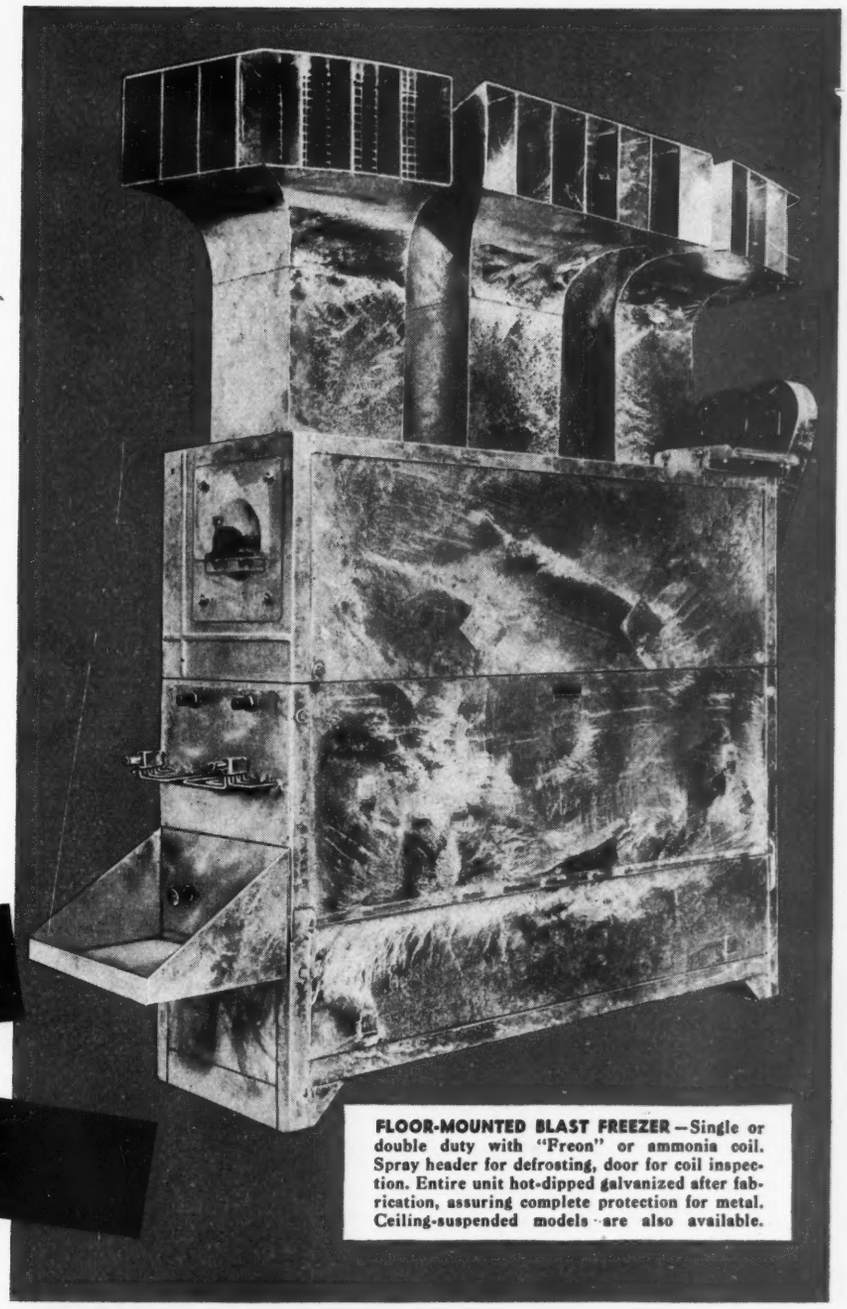
**Leonard C. Monahan,** 55, vice-president and sales manager of 40-Fathom Fish, Inc., April 4, at South Weymouth, Mass.

**W. H. Strowd,** 56, executive secretary National Soft Wheat Millers Association, Nashville, Tenn., recently.

**John V. Compton,** 37, Georgia district manager for Libby, McNeill & Libby, recently, in Savannah.

**Edwin J. Mapes,** 59, son of one of the founders and retired official of Belle Vernon-Mapes Dairy Co., Cleveland, April 6, in Cleveland.

**Marcus D. Munn,** 88, president emeritus and founder of the National Dairy Council, recently in Chicago.



**FLOOR-MOUNTED BLAST FREEZER**—Single or double duty with "Freon" or ammonia coil. Spray header for defrosting, door for coil inspection. Entire unit hot-dipped galvanized after fabrication, assuring complete protection for metal. Ceiling-suspended models are also available.

# more "seasons" with FLEXIBLE FREEZING

THE quick-freezing plant that doesn't have to depend on the short season of one crop turns more food into profits. Such a plant needs refrigeration equipment flexible enough to freeze many foods as they become available—vegetables, fruits, poultry, sea-food, precooked food. That means they need Carrier Blast Freezers.

These rugged standard units have enough reserve capacity to handle emergency loads. They freeze more food faster when speed is important. They cut handling cost, too. The food is frozen right on the truck—no loading and unloading freezer shelves. And they operate on the refrigerating system you now have.

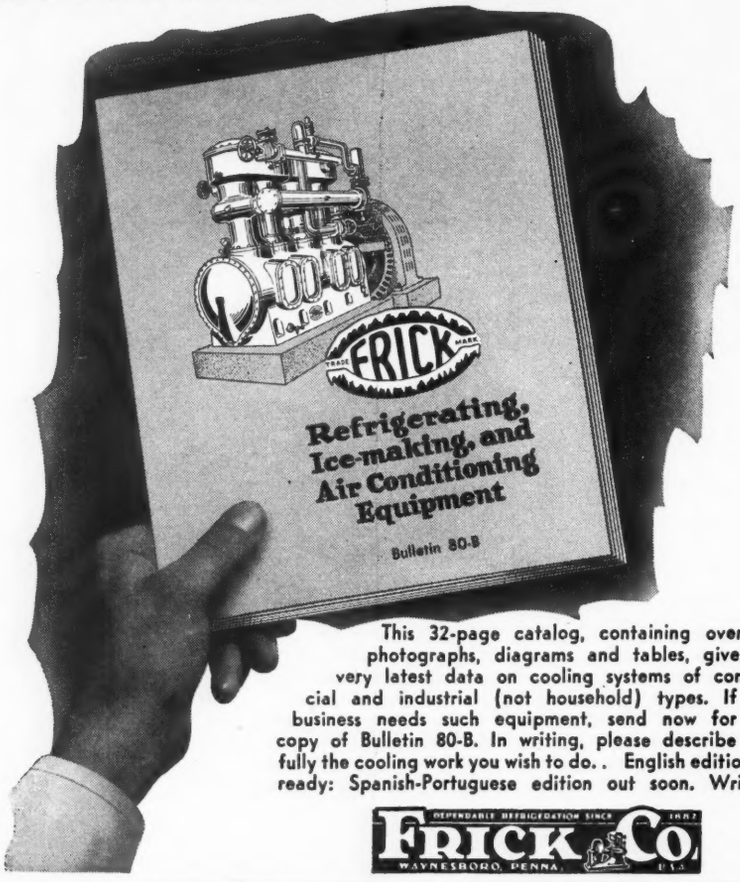
When you install Carrier Blast Freezers, you get the *plus value* of Carrier leadership in air conditioning and refrigeration. Pioneering research and unrivaled engineering skill assure long, trouble-free service, low operating and maintenance cost.

Carrier's timely booklet, "Frozen Foods—a billion dollar market," tells how Blast Freezers can help you operate more "seasons" in a year—and boost profits. Write for your free copy today. Carrier Corporation, Syracuse, N. Y.

**Carrier**

**AIR CONDITIONING**
**REFRIGERATION**
**INDUSTRIAL HEATING**

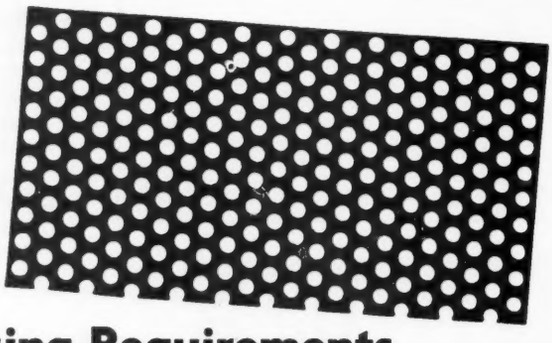
## Get this informative Book




This 32-page catalog, containing over 150 photographs, diagrams and tables, gives the very latest data on cooling systems of commercial and industrial (not household) types. If your business needs such equipment, send now for your copy of Bulletin 80-B. In writing, please describe carefully the cooling work you wish to do.. English edition now ready: Spanish-Portuguese edition out soon. Write to

FRICK CO.
WAYNESBORO, PENNA.

# MATCHING SCREENS



## to meet Your Processing Requirements

Hendrick Perforated Metal Screens assure fast, full-clearance screening and long service life because they are made to meet your specific requirements. Materials are selected for the application: stainless steel, aluminum, copper, brass, bronze, Monel, nickel or other commercially rolled metals. Perforated sheets are furnished in any required shape or size of opening, and flat, flanged or curved to any diameter.

Put your process screening problems up to Hendrick.

# HENDRICK
*Manufacturing Company*

**Perforated Metals**
**Perforated Metal Screens**
**Architectural Grilles**
**Mitco Open Steel Flooring, "Shur-Site" Treads and Amorgrids.**

**49 DUNDAFF STREET, CARBONDALE, PENNA.**

*Sales Offices In Principal Cities*


# ASSOCIATED INDUSTRIES

**Container Corp. of America** has acquired, through exchange of stock, control of California Container Corp., Oakland, Calif. The latter company operates fiber and corrugated box plants in Seattle, Emeryville and Los Angeles. N. Chase Flint will continue as president of the California organization.

**Continental Can Co.'s** Mankato, Minn., plant was awarded the State of Minnesota's safety banner for the second time, signifying two years of operation with no lost time accidents. The presentation was made to Plant Manager A. J. Rosecky by Governor Thye, at a ceremony in Minneapolis.

**Dean Milk Co.**, Melrose Park, Ill., is building a milk packaging plant at Huntley, Ill. The plant, to be completed May 1, will cost $500,000.

**The Diversey Corp.**, Chicago, has appointed J. S. Gardner to manage the company's newly organized canning industry promotional department.

**Food Machinery Corp.** has announced the appointments of J. B. Cary, J. M. Hait, P. C. Wilbur and B. C. Carter as vice-presidents of the company.

**The Gridler Corp.**, Louisville, Ky., has enlarged the technical staff of its Votator Division and has appointed Alton E. Bailey to head one of the research and engineering groups specializing in the development and improvement of processes and products in the field of edible fats and oils.

**Howard Engineering and Manufacturing Co.** has appointed Harley E. Huddle as secretary-sales manager. He formerly was chief engineer.

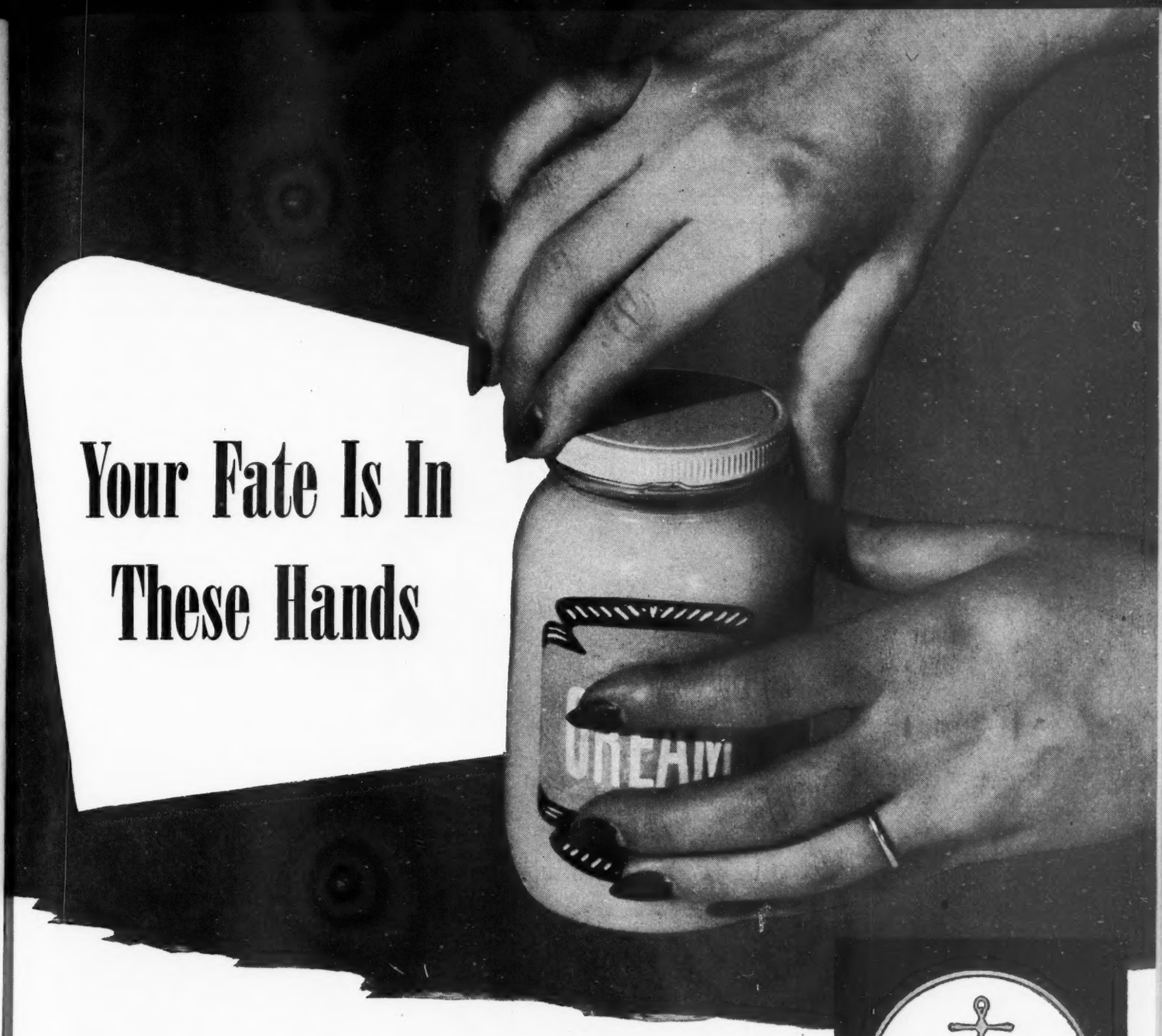
**Arthur D. Little, Inc.**, Cambridge, Mass., has announced the appointments of Dr. Austin W. Fisher and Dr. Bruce S. Old to the staff.

**The Methieson Alkali Works**, manufacturers of heavy chemicals and chemical specialties, is soon to build a new plant at Niagara Falls, N. Y. The structural steel for the building is on hand and construction, expected to cost $150,000, will be started as soon as preliminary operations are completed. This is the second recent addition to the company's facilities at Niagara Falls. Completion of another plant there, for increased production of sodium chlorite, was announced last September.

**Marathon Corp.**, Menasha, Wis., has appointed John H. Snyder as sales manager for the meat and vegetable oil packaging department.

**Owens-Illinois Glass Co.**, Toledo, Ohio, has appointed Leonard G. Phillipps, recently returned from the Navy, manager of the closure sales division.

# Your Fate Is In These Hands



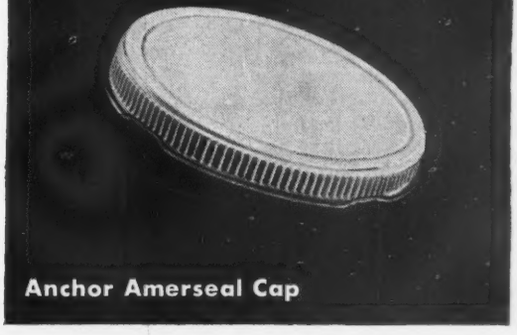
WHEN your package is sealed with an Anchor Amerseal Cap you can be sure that the consumer's reaction will be favorable insofar as the sealing and convenience of the package is concerned. You can be sure that every one of your packages will open easily at the merest twist of the wrist and that the same simple, easy quarter turn will reseal them tightly and securely again.

The whole secret of the effectiveness as well as the convenience of the Anchor Amerseal Cap lies in its lug construction. Equally spaced lugs engage the under side of corresponding threads in the glass finish and draw the cap and liner down, effecting a tight uniform contact around the top edge of the container finish. Because the cap makes contact at only a few points around the container finish, and these on the under side of the glass threads, contact is easily broken and the cap removed with perfect ease.

Anchor
CONTAINERS and CAPS

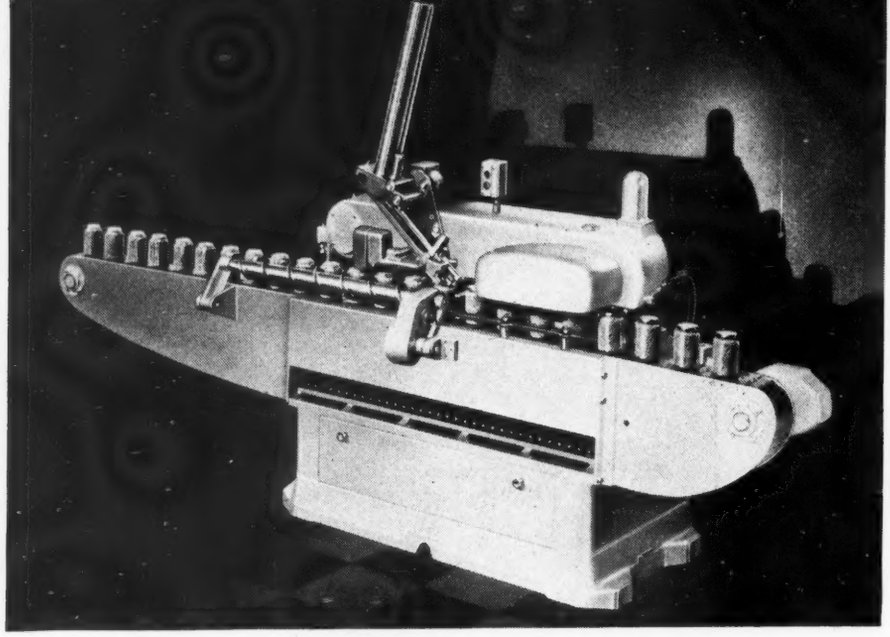
Tune in ANCHOR HOCKING'S HOBBY LOBBY
CBS NETWORK . . . THURS. EVE.

PRODUCTS OF
ANCHOR HOCKING GLASS CORPORATION
LANCASTER, OHIO



Anchor Amerseal Cap

# FOOD EQUIPMENT NEWS



Automatic vacuum capping machine.

## Vacuum Capping Machine

ANCHOR HOCKING GLASS CORP., Dept. I, Lancaster, Ohio, announce an automatic, high speed, straight-line vacuum capping machine. It is especially designed for the application of caps on glass jars and bottles having a pry-off ledge or a shoulder pry-off finish. The seal is effected by dry, live, superheated system. By superheating the steam is fully expanded, thereby reducing condensation to a minimum and providing the maximum vacuum for the volume of steam used. The superheated steam is injected into the headspace of the container as the cap is automatically picked off the end of the feed chute. The cap is applied while the headspace is saturated with steam. The resultant vacuum created by condensation of the steam causes the closure to be held in place by atmospheric pressure. To assure that the cap is securely sealed, the package travels under a short auxiliary sealing belt.

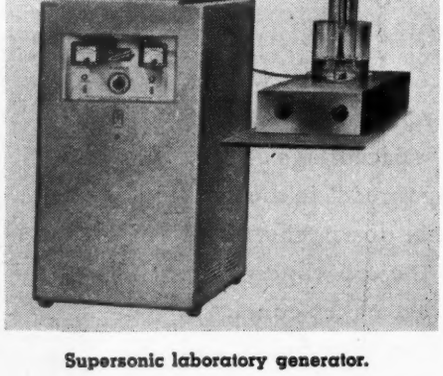
Any desired degree of commercial vacuum on hot or cold packed products is said to be able to obtained and maintained by a simple adjustment of the steam flow. The package is in full view during the entire operation. The machine has a flexible sealing range of from 75 to 250 or more containers per minute. It will apply Anchor AH-N caps from 27 mm. to 90 mm. inclusive and will handle jars with heights ranging from 3 in. to 8½ in. and diameters of from 2 to 4 in.

Caps are shipped nested, ready to remove from their cartons and drop into the cap feed. The automatic feed is positive in action, and feeds from the bottom of the stack in a simple rotary motion.

## Supersonic Generator

FISHER Scientific Co., Dept. I, 711 Forbes St., Pittsburgh, Pa., have announced a laboratory instrument which makes available ultra-sonic energy for scientific research called "Ultra-Sonorator."

It is about the size of a good-sized radio, operates on 110 v., 50- to 60-cycle current, and produces over 500 w. of high-frequency energy. Accurately ground quartz crystals control the frequency of the oscillations produced. Four frequencies are possible with the instrument—100, 400, 700 and 1,000 kilocycles per second. Any other specific frequency in this range may be obtained by the purchase of relatively inexpensive additional crystals.

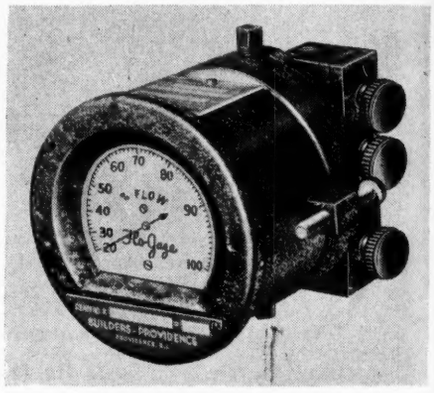


Supersonic laboratory generator.

In practice, the bath is filled with heavy oil and the Supersonic energy is transmitted from the crystal, through the oil, to the experimental material immersed in the bath. One interesting phase is that under one set of conditions the application of these Supersonic waves produces oxidizing effects, while under other conditions reducing actions are produced.

## Flow Gage

THIS rate of flow indicator is suitable for water, steam or gas and is built by Builders-Providence, Inc., Dept. I, 66 Coddington St., Providence, R. I. This midget differential meter indicates rate of flow of liquids and gases through lines containing orifices, venturi tubes and insert nozzles as differential producers and also indicates liquid level and pressure differences.



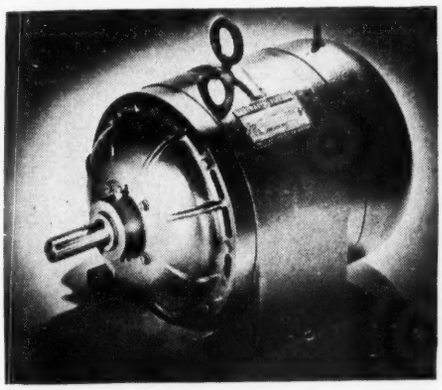

Fluid flow rate indicator.

The flow gage can be used to advantage in measuring adequate supplies of oil or gases to vats, tanks, dryers, kilns or ovens; cooling water for condensers, tanks, and process equipment. Features of the unit are its simplicity, accuracy, legibility, sensitivity and low cost. The gage has no stuffing box and is said to require a minimum of maintenance. It can be furnished to measure such

units as gallons per minute, cubic feet per hour, etc. It is said to indicate flow rate within 2 percent of full scale. The mechanism is enclosed in a heavy semi-steel chamber having a thick pre-stressed glass window designed for an operating pressure of 500 psi.

## Totally Inclosed Motor

GENERAL ELECTRIC CO., Dept. I, Schenectady, N. Y., announce a totally inclosed fan-cooled motor especially designed for use in extremely dusty, dirty or corrosive atmospheres. It is available in standard explosion-proof and dust-explosion-proof types from 1 to 1,000 hp. It is said to be short in length and compact in construction and is suitable



Totally inclosed induction motor.

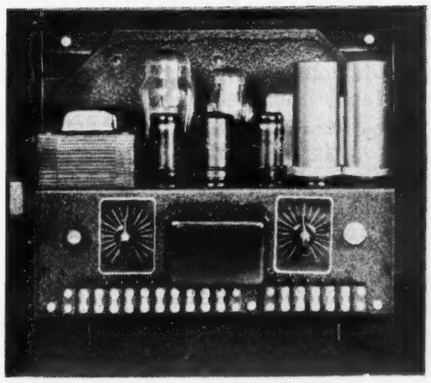
for installing on machine tools and other motor-driven equipment.

The new motor has a double-shell, cast-iron frame, cast-iron end shields and conduit box for protection from external blows, dripping water, dusts, vapors and corrosive liquids. Pressure-relief greasing system is used and greasing can be accomplished without stopping the motor.

## Roller Conveyor

LYON METAL PRODUCTS, INC., Dept. I, Aurora, Ill., announce a "packaged" line of gravity roller conveyors. They are available in three straight line sections, all 10 ft. long and in three widths, 12 in., 18 in., and 24 in.; three 90 deg. curved sections, same widths as above, and two trestles, 18 and 24 in. wide. Each item is a complete unit.

The small retainer channel just under the top flange of the frame rails covers the end of the roller shafts. This provides a safety feature which eliminates visible cotter pins or "hog-rings." The rollers are set slightly above the level of the tops of the side rails to accommodate packages that are wider than the conveyor section itself.



Highspeed registration control.

## Registration Control

THE Fisher-Pierce Co., Dept. I, 65 Ceylon St., Boston 21, announces high speed registration control for use on either intermittent or continuous flow high-speed wrapping machines.

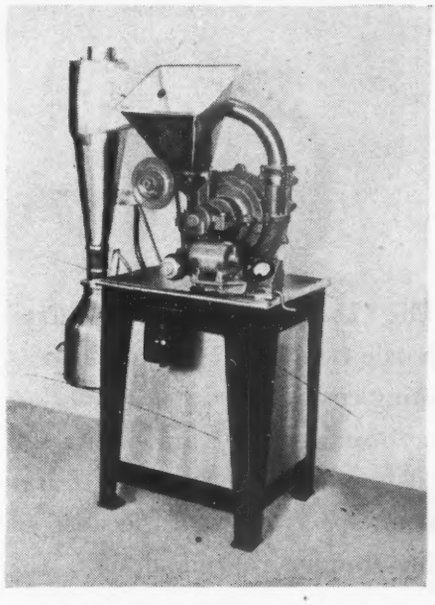
The entire chassis of the registration control is so designed that it plugs into the wrapping machine as simply as a tube in a socket.

The intelligence is initiated in the photocontrol by the change of light intensity as the registration mark enters the scanner field of view. Scanners are designed for either reflected light or transmitted light.

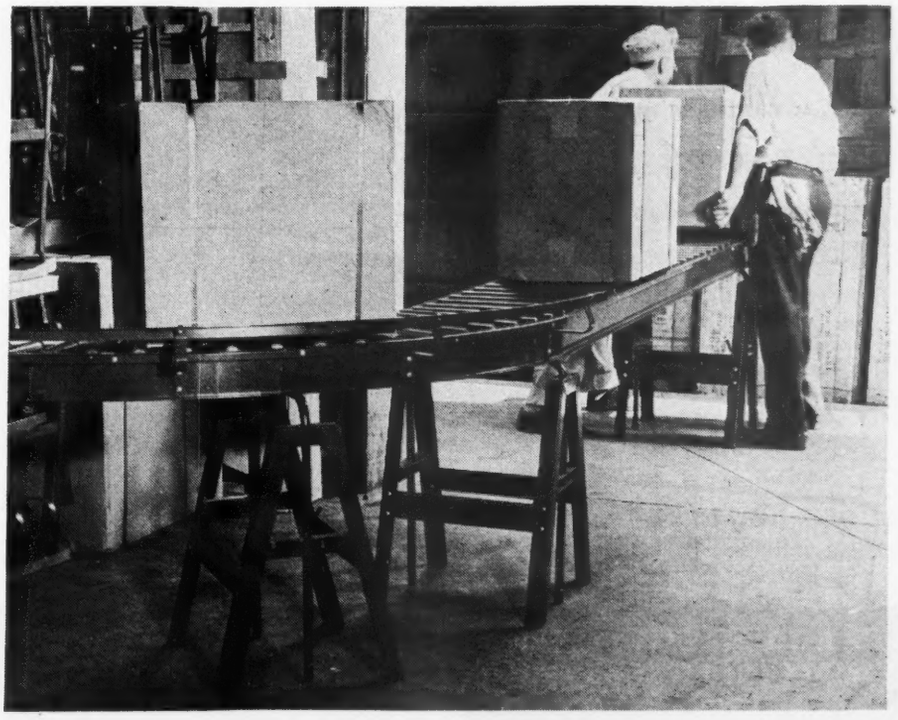
## Screenless Pulverizer

A DUSTLESS, screenless pulverizer, known as the No. 5 Mikro-Atomizer, especially suited for small quantity production and pilot plant or laboratory work, has been announced by the Pulverizing Machinery Co., Dept. I, 23 Chatham Rd., Summit, N. J. Said to be exceptionally cool in operation, this mill will grind from 5 to 200 lb. per hour and is capable of reductions to ultrafine particle sizes in the 1 to 25 micron range.

It uses a 5 hp. motor. It imparts a centrifugal force to each particle and opposing that force is an aerodynamic drag. The raw material, fed into the mill from the customary hopper, is first pulverized by rotating hammers, then carried by an air stream into a separator wheel whirling at 7,000 to 10,000 r.p.m. A fan adjacent to the separator wheel



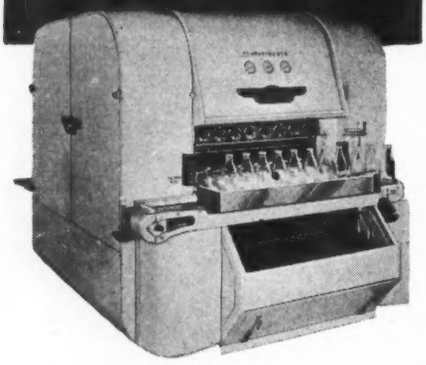
Pilot plant screenless pulverizer.



Gravity roller conveyor.

**REDUCE OPERATING COSTS *with the* VIKING Bottle Cleaner**

**Handle Square Bottles Without Adjustment**



The VIKING insures immaculate bottle cleaning and reduces operating costs, too. Caustic solution is conserved — maintenance costs are extremely low — less floor space is used. Because of its simple, rugged design, the new square bottle can be handled in the same machine without any mechanical adjustments.

Other advantages include:

- ✓ Simple loading
- ✓ Long submerged soak
- ✓ Double inside and outside hydro scrubbing with mild alkali solution.
- ✓ Hydro pressure rinse
- ✓ 20-90 bottles per minute.

*Write today for latest information, stating your own process requirements*

**BARRY-WEHMILLER MACHINERY COMPANY**

1946 . . . Our 61st Anniversary

ST. LOUIS, MO., U. S. A.


exerts just enough suction to draw out and discharge the finest particles. The coarser particles, increased in gravitational weight by the centrifugal force imparted by the separator wheel, resist the pull of the fan and drop back into the path of the hammers, where they are beaten and rebeaten until reduced sufficiently to yield to the pull of the fan.

All parts in contact with material being ground are 18-8 stainless steel, with the exception of body castings, which are of a high nickel-iron alloy or other machineable alloys.

## Rotameter

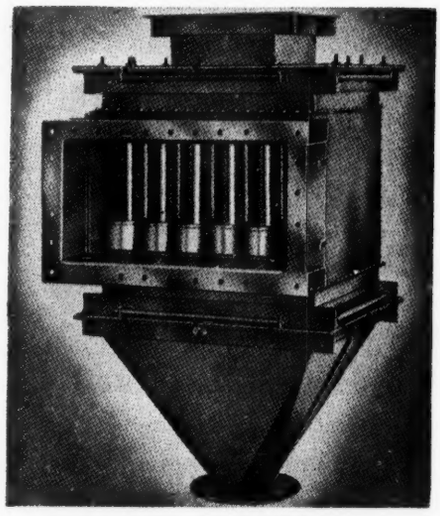
SCHUTTE & KOERTING, Dept. I, 1159 N. 12th St., Philadelphia 22, Pa., have designed a Rotameter so that metered fluid comes into contact only with parts made of special material such as Haveg, Pyrex, Karbate, porcelain, hard rubber, etc. Also special rotors of platinum, silver or other corrosive resistant materials are available.

## Meat Lug

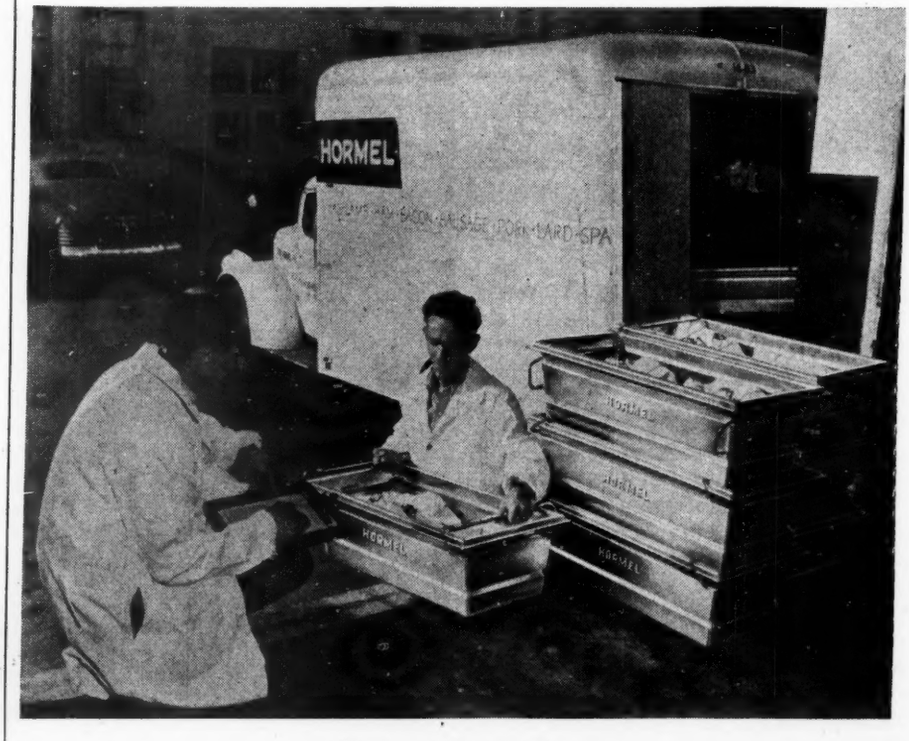
J. M. GORDON CO., Dept. I, 756 South Broadway, Los Angeles, Calif., has introduced a non-corrosive meat lug built of alloy aluminum. It has an all-welded construction and rounded corners which is said to completely eliminate cracks and crevices and hence is easier to clean. The alloy aluminum used is non-corrosive and is said not to contaminate wet meats placed in direct contact with the metal, eliminating the use of paper lining. It weighs 11¼ lb. and has a capacity of from 100 to 125 lb. of meat. Its dimensions are 32x13½x 10 in. deep. Tapered construction permits empty containers to be nested.

## Dust Collector

INTRODUCED by Aerotec Company, Dept. I, White Plains, N. Y., is a dust collector which operates with no-pressure build-up characteristic which is said to assure continuous equal suction at throat of hoods, resulting in high collection efficiency. A fan unit of high static pressure type overcomes resistance of the collector unit and develops 2 in. w.g. or more at throat of a closely coupled hood.



**Continuous dust collector.**




**Aluminum alloy meat lug.**

# How Patapar HELPS SELL FOODS

## Keeps them fresh

Patapar* Vegetable Parchment has qualities to keep foods fresh – appealing. It has high wet-strength. It resists penetration of fats, grease, oils. It is odorless. Tasteless.

**Looks smart** Patapar has a rich, translucent texture. It is smart looking – distinctive. When a shopper sees a Patapar-wrapped product, right away she thinks of quality. This helps make sales.

**Beautiful printing** Patapar can be beautifully printed with bright colors and designs. We do the printing in our own plants which are completely equipped for printing Patapar by letterpress or offset lithography.

If you want your Patapar printed, just call on us. We'll make sketches for you – do the art work – engravings – everything.

**Keymark** Many users of Patapar include this nationally advertised keymark on their printed wrappers. It's a way to tell customers that the product inside is well protected. *Reg. U. S. Pat. Off.

### A FEW OF PATAPAR'S USES

Wrappers for butter, meats, fish, cheese, poultry, shortening, ice cream, vegetables. Carton and box liners. Bulk packaging units. Milk can gaskets. Milk bottle hoods. Can liners.

**Paterson Parchment Paper Company • Bristol, Pennsylvania**

*Headquarters for Vegetable Parchment Since 1885*

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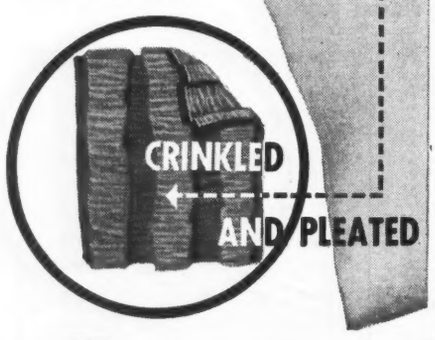
BRANCH OFFICES: 120 BROADWAY, NEW YORK 5, N. Y. • 111 WEST WASHINGTON ST., CHICAGO 2, ILL.

# CHASE LINERS

** Stop Liner Breakage!*
** Stretch in All Directions!*

Chase Liners are better, more resilient, more flexible! Here's why: they're crinkled for vertical elasticity *and* pleated for horizontal elasticity! Result: no more broken liners nor costly damage to contents due to liner failure or breakage.

Check on Chase Liners today. They're the crinkled and pleated liners that assure savings . . . that actually cost no more!




**CHASE BAG CO.**

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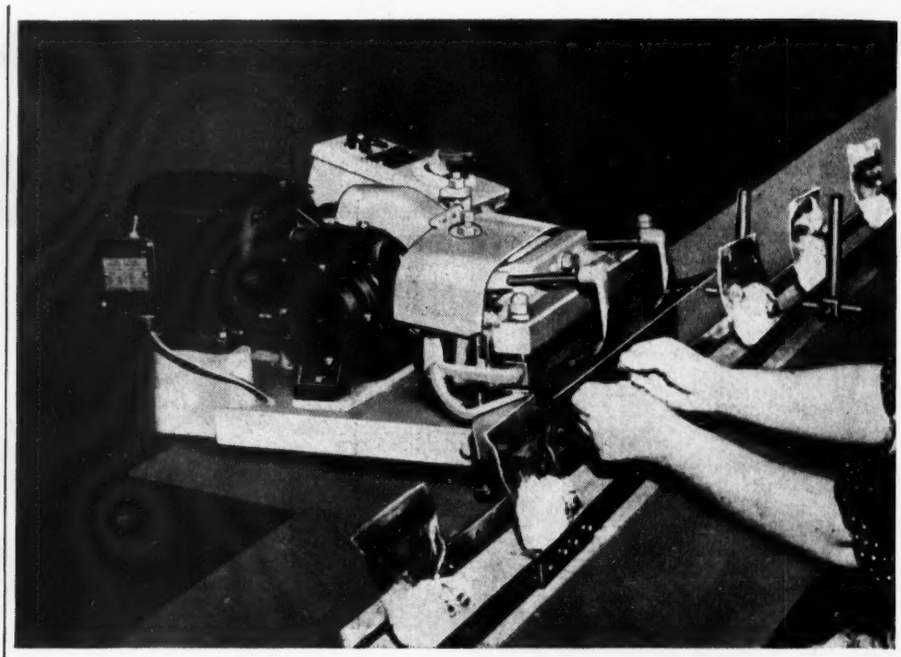
CHAGRIN FALLS, O. • HUTCHINSON, KAN. • WINTER HAVEN, FLA.

**Pacer model faster heat sealer.**

## Fast Heat Sealer

HEAT SEAL-IT CO., Dept. I, 4316 Lancaster Ave., Philadelphia, Pa., announce a faster, more versatile crimp heat sealing machine called the "Pacer" model. Fully adjustable for both pressure and temperature, this machine is said to handle any type of heat sealing bag material from the lightest weight transparent cellulose to the heaviest combinations of laminated papers, cloth and foils.

Among its outstanding features are automatic folding mechanism that neatly and uniformly folds the top of the bag at the same time that the seal is made, and more efficient hydraulic type of thermostatic heat control that assures correct temperature at all times.

In addition the following attachments are available: (1) automatic date coding attachment that embosses a series of figures directly in the seal all in one operation, and (2) hole punching attachment for placing a round clean hole right in the center of the seal at the same time that the bag is folded and sealed.

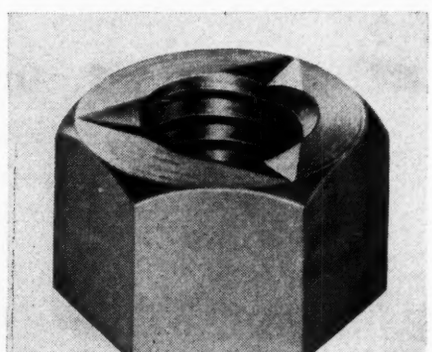
Other special models to handle large, square bulky bags and other special requirements are available.

## Oxygen Recorder

AUTOMATIC continuous analyzer for indicating and recording the oxygen content of a gaseous mixture has been developed by Bailey Meter Co., Dept. I, Cleveland 10, Ohio. This instrument is said to have been successfully applied to boiler furnaces, kilns and similar operations. The instrument provides a graphic analysis almost instantly and is said to be responsive to changes of 0.05 percent oxygen. Sustained accuracy is said to be within 0.25 percent. The instrument functions as follows: a continuous gas sample is mixed with a vaporized liquid fuel and burned on a catalyst filament which reaches a temperature proportional to the oxygen content. A high speed sampling system for handling dirty, high temperature gases is furnished with the instrument when required. Oxygen recorders applied to all types of furnaces operating with oxidizing atmospheres are said to permit closer regulation of fuel-air ratios. This is especially so where multiple fuels are used or where the firing rate changes rapidly.

## Lock Nut

A LOCK NUT that requires no lock washers or cotter pins is offered by Grip Nut Co., Dept. I, 306-J S. Michigan Ave., Chicago 4, Ill. The one-piece self-locking nut is of standard dimensions and is said not to be af-



**Self-locking nut.**

# CARGO – SERVED UP AIR LINE STYLE!

To TWA—long one of the world's leading air lines—a single minute can mean five miles travelled in the air, or five miles lost on the ground. More than a year ago, Trans World Airline set out to shorten cargo handling time at terminals to keep pace with faster flight schedules made possible by improved aircraft.

After making a thorough study of its existing handling methods and investigating the methods and equipment used by other air lines, as well as by the Army and Navy during the war, TWA selected Towmotor Lift Trucks and Industrial Tractors, basing its choice on Towmotor's performance in handling all types of air cargo.

An unusual application of the lift truck system was worked out by TWA, whereby special 4-wheeled cargo trailers are moved in trains to plane side by Towmotor Tractors, at which point a Towmotor Lift Truck raises each trailer to plane loading level. This arrangement not only speeds up loading and unloading, but the trailer itself provides extra working space for cargo handlers, simplifying movement of cargo in and out of the plane and expediting balanced loading, particularly important in air transport.

The use of 4-wheeled trailers with Towmotor Tractors also enables TWA to collect various types of cargo, such as baggage, air mail and air express, at separate points in the terminal and move it rapidly and safely to plane side for loading. Similarly, unloaded cargo is distributed quickly and carefully to various locations at the airport.

For every handling problem there is an engineered solution . . . a solution based upon Towmotor experience and know-how gained in solving handling problems in every industry. Send for your copy of the Towmotor Lift Truck ANALYSIS GUIDE today. Towmotor Corporation, 1222 East 152nd Street, Cleveland 10, Ohio.

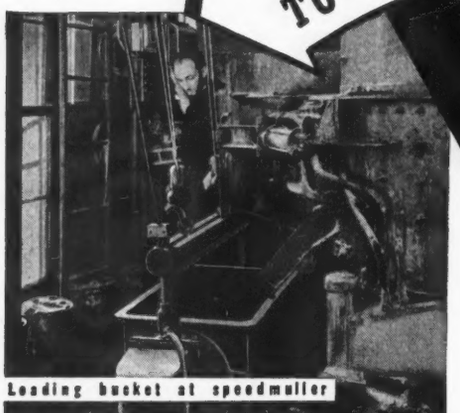
***TAKE IT UP WITH***

**TOWMOTOR**

***THE ONE-MAN-GANG***

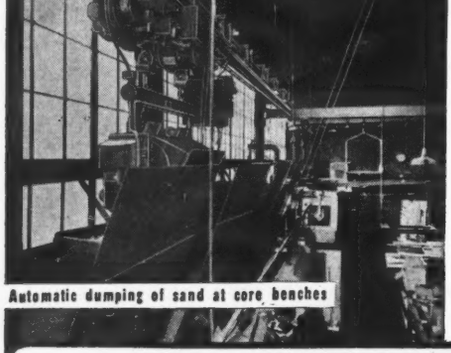
# Automatic MONORAIL System

## DELIVERS CORE SAND TO 9 STATIONS



Loading bucket at speedmuller

Push button control dispatches carrier



Automatic dumping of sand at core benches

**FROM a simple push button control, operator of speedmuller keeps nine core makers supplied with fresh core sand at all times.**

**This system operates as follows —Self-dumping bucket is lowered to floor at speedmuller to receive core sand. Operator raises bucket with twin hook hoist, sets the station selector and then presses starter button. The unit runs to the proper station and stops — bucket makes complete revolution dumping sand in hopper — whereupon the unit returns to loading station. All this operation occurs automatically, with no further attention from operator.**

**This is just another of the many automatic systems designed by American MonoRail Engineers using the American MonoTractor. Let us tell you more about this rubber wheel drive unit. An engineer will consult with you without obligation.**

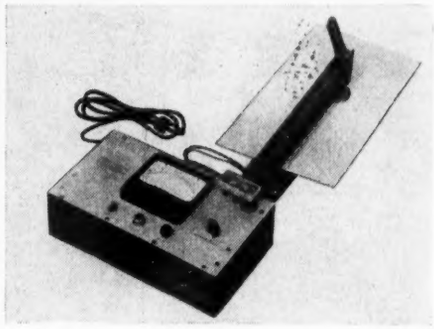
THE AMERICAN MONORAIL COMPANY

13125 ATHENS AVE. ● CLEVELAND 7, OHIO


fected by oil, water or chemicals. All that is needed is a wrench to apply or remove it. The triangular deflection on the top of the nut provides a controlled friction lock. The nut is free-spinning until the bolt threads contact the deflected threads near the top of the nut. Extensive tests are said to show that the nut can be applied and reapplied many times without appreciable loss in its locking power.

## Moisture Tester

COLLOID EQUIPMENT CO., INC., Dept. I, 50 Church St., New York 7, announce the development of Delmhorst moisture detector for materials in sheet form. It determines moisture content of materials in sheet form such as wrapping paper, cardboard and similar materials quickly. It combines electrical circuits and electronic principles in a practical meter which operates on 110-v. a.c. light circuit. It is especially recommended for moisture determinations, with close accuracy of materials with moisture contents ranging between 3 and 15 percent.

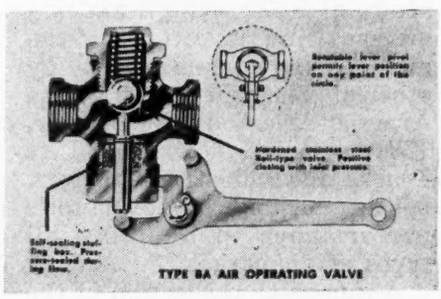


Moisture detector.

The sheet material to be tested is clamped between electrodes and the reading is indicated directly by the moving needle on the dial.

## Self-Sealing Valve

LESLIE CO., Dept. I, 89 Delafield Ave., Lyndhurst, N. J., announce a self-sealing, air operating, ball type valve known as type BA. Fitted with a hand opening lever and a rotatable




Air operating ball type valve.

# BETTER SELLING BEGINS WITH BETTER PACKAGING!

Selling begins with the package, and better selling calls for A.C.M. Clay Coated Cartons. For these famous cartons give any packaged product a better *"sales front."* Their velvet-smooth surface, produced by an exclusive, continuous process, adds luster and brilliance to any design, makes it stand out in today's competition for eye-buying shoppers. Put your product at the head of the sales parade with a better package —an A.C.M. Clay Coated Carton!

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**MARKS OF A.C.M. SUPERIORITY:**

Whiter board—
velvet-smooth surface—more rigid—
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superior reproduction in either letter-press or lithography.

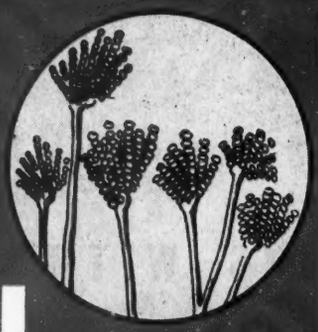
*The Secret is in the SURFACE*

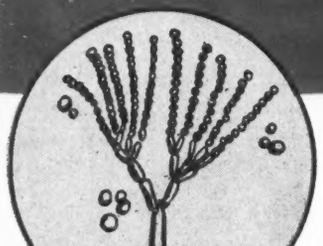
**AMERICAN COATING MILLS**

**A.C.M. CLAY COATED CARTONS AND CARTON BOARD**

Here is a NEW answer to

# MOLD CONTROL





HERE are three of the many trouble-causing varieties of mold. They are commonly encountered in cold storage plants, food plants, proofing rooms of baking establishments and many other places. Wherever found mold growths are a constant threat to product quality.

But a NEW answer for the control of mold on surfaces of walls, ceilings, floors and certain equipment is now available. It is a NEW specially designed material in powder form known as

## OAKITE
TRADE MARK REG. U. S. PAT. OFF.

# TRI-SAN

Due to its potent germicidal and fungistatic activity, a solution of Oakite TRI-SAN, applied to surfaces with cloth or brush inhibits and controls the growth of mold organisms such as aspergillus, Penicillium and Rhizopus. Safe to use, highly effective, extremely economical, we invite you to make tests of Oakite TRI-SAN and see for yourself how successfully it combats mold growth.

**Send for this FREE Booklet**

This 20 page booklet gives you complete directions for using and applying Oakite TRI-SAN in connection with mold control and many other plant sanitation problems. Your copy is free for the asking . . . write for it today.

**Oakite Products, Inc., 26G Thames Street, New York 6, N. Y.**
*Technical Service Representatives Located in All Principal Cities of the United States and Canada*

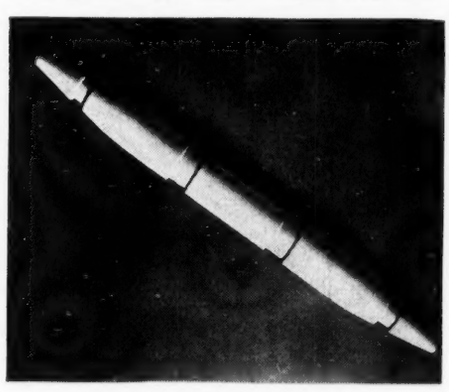
OAKITE MATERIALS METHODS SERVICE — Buy Bonds for Victory — CLEANING FOR EVERY CLEANING REQUIREMENT


pivot so that the lever can be located in any position, and valve can be opened instantly from almost any position with either a horizontal or vertical pull, according to the manufacturer. Ball valve closes tight with inlet pressure and will not collect dirt or other foreign matter.

Stuffing box is not accessible to tampering or adjustment and is self-packed by the operating pressure when the valve is open, permitting flow. Operating pressures up to 200 psi. are recommended. It is constructed with cast iron body, integral seating surfaces, screwed connections and in ½ in. size.

## Hog Gambrels

BASIC FOOD MATERIALS, INC., Dept. I, 806 Broadway, Cleveland, Ohio, are now marketing hardwood hog gambrels. They are said to be strong enough to hold any weight hog and



**Hardwood hog gambrels.**

are machined to give an extra smooth finish. Center grooves are made to fit all standard hooks. Standard sizes are 1⅞ in. in diameter by 22 in. long. Special sizes can be made to customer's specifications.

## Multi-Position Controller

WHEELCO INSTRUMENTS CO., Dept. I, 847 W. Harrison St., Chicago, Ill., announces a multi-position electronic pyrometer controller which they call "Multronic Capacitrol." The unit is intended to meet applications requiring instantaneous, accurate indication and control of temperature, voltage, current, signaling and similar variables in process industries. It provides (1) conventional on-off control at one or two different points, (2) control of two separate fuel systems on a single pot or other heat-treating type furnace, (3) automatic positioning control for electric, oil and gas-fired equipment, (4) on-off control plus automatic fuel shut-off, (5) multi-signaling at two points or two signals at dual points. Two circuits provide instantaneous control action.

# CATALOGS, BULLETINS

**This selected information on new publications is offered by FOOD INDUSTRIES Readers' Service through cooperation with the manufacturers. It helps executives save valuable time. To obtain literature described, simply fill in form below, clip it to your letterhead and mail to FOOD INDUSTRIES. There is no cost, no obligation.**

### Food Plant Equipment

**Rotary Pumps .....1**
The Blackmer Pump Co. has issued Bulletin No. 307, which carries for the first time a comprehensive illustration and description of a new type of removable liner that is now standard construction.

**Water Treatment .....2**
Bulletin 242 from the Lapp Insulator Co. describes the "Pulsafeeder" proportioning pump for measured addition of chemicals in water treating systems.

**Cooling Units .....3**
Much practical engineering information has been included by Rempe Co. in their Catalog No. 110 on Overhead Blower Units, for low temperature cooling.

**Motor Starters .....4**
Allis-Chalmers Manufacturing Co. emphasize safety features in a new bulletin on their Type H line of motor starters.

**Canning Machinery .....5**
Berlin-Chapman Co. has issued an 88-page bulletin describing and illustrating a complete line of canning equipment. In it are included various kinds of processing equipment, as well as a variety of control instruments.

**Compressors and Pumps.....6**
The Gardner-Denver Co. has released a well-illustrated 40-page brochure covering installations in which compressors and pumps of various types are used. Applications of equipment in various industries are well illustrated with action photographs.

**Auto-Centri Clutch .....7**
Bulletin No. 45 has just been issued by Hardinge Co., Inc. It is devoted to a description of the Auto-Centri clutch in operation as well as the various types available for different requirements.

**Hot Water Heaters.....8**
The Ramona Products Co. has released a 4-page pamphlet describing and illustrating their industrial hot water heaters. Details covered are, the cost of installation, wide range of capacities and other pertinent information.

**Mixers .....9**
A 4-page leaflet, describing several applications of "Lightnin" portable mixers, has just been released by the Mixing Equipment Co., Inc.

**Dairy Equipment .....10**
*Allegheny Metal in the Dairy Industry* is the title of a profusely illustrated 36-page file-size book just published by Allegheny Ludlum. Stainless steel dairy equipment is shown.

### Plant Supplies

**Essential Oils .....11**
Magnus, Mabee & Reynard, Inc., has issued catalogs containing interesting data on essential oils and related products grown and distilled in this country.

**Boron Carbide .....12**
Hardest of all electric furnace products and ranking next to diamond, boron carbide has a variety of uses as an abrasive and for making high pressure nozzles. Additional uses are given in a 10-page book from The Norton Co.

**Insecticides .....13**
Recommendations and precautions in using DDT are summarized in an 8-page folder issued by Pennsylvania Salt Manufacturing Co., which gives dust and spray data.

**Detergent .....14**
*Columbia Phosflake* is the title of a new folder from Pittsburgh Plate Glass Company which describes a product especially prepared for effective machine washing of bottles. Times, strengths, temperatures are included.

**Rust Prevention .....15**
Nox-Rust Chemical Corp. has released a 24-page catalog giving detail information on their line of rust preventatives, protective coatings and related materials. How the various materials are applied and removed is described and illustrated.

**Germicide .....16**
Turco Products, Inc. has issued a leaflet describing a quaternary germicidal agent that is said to be particularly useful for the dairy industry. The leaflet describes "Thoral" as a newly developed sanitizing agent offering exceptional efficiency.

**Protective Coating .....17**
Prufcoat Laboratories, Inc. has released a bulletin describing the versatile properties of their coating materials. It can be painted on by brush, spray gun, or dipping. It dries in a few minutes and can be applied by a maintenance crew. No baking necessary.

**Tygon Products .....18**
A recent folder from U. S. Stoneware Co. gives a color list, package sizes and prices on Tygon protective paints. Stoneware also announces new couplings for Tygon plastic tubing, increasingly used for both plant and laboratory work.

### Control Equipment

**Refrigeration Instruments .....19**
Special gages and thermometers for refrigeration service are shown in a 20-page folder issued by Jas. P. Marsh Corp.

**Thermometers and Hydrometers...20**
The Gotham Instrument Co. has released illustrated Catalog No. C-51, 16 pages, covering the company's line of etched stem thermometers and hydrometers.

**Automatic pH Control.....21**
A 12-page bulletin, issued by Leeds & Northrup Co., describes its latest automatic pH control system. To illustrate its applications, a description of how the system works in cane sugar mills is described. It tells how lime flow can

Good until July, 1946

**FOOD INDUSTRIES READERS' SERVICE**

FOOD INDUSTRIES, 330 W. 42nd St., New York City 18

Please have manufacturer send me, without obligation, literature circled below.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | |

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5-46

# SPOILAGE? ELIMINATE THE CAUSE

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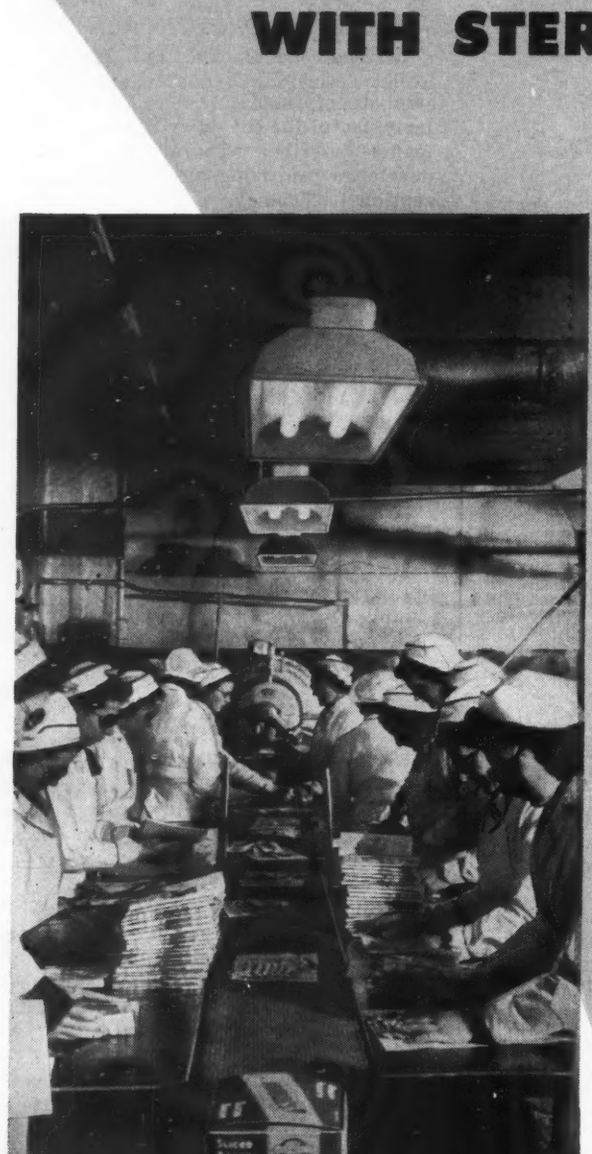

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be controlled by continuously detecting the pH of raw juice and thus regulating the lime flow as required. The system is made to indicate and report continuously directly in pH. Also included in the bulletin is a description of a glass electrode assembly now available for the cane sugar applications.

**Surface Pyrometers .....22**

Ingenious applications of pyrometry to moving equipment, such as rollers, are described in Cambridge Instrument Co.'s new 12-page Bulletin No. 194-SA, on Surface Pyrometers. Special surface pyrometers are available also for hard-to-reach locations. Needle models are useful for plastic materials.

**Dairy Instrumentation .....23**

Instruments for the dairy industry are described in a new bulletin from The Bristol Company. Bulletin T825 includes recording thermometers and mercury indicating types. Bulletin TA827 gives specifications on the high-temperature short-time control system. Bulletin T829 lists flow diversion valves and thermal limit controllers.

**Temperature Controls .....24**

Catalog No. 14, consisting of 16 pages in which open and closed relays and various types of thermal regulators are illustrated and described, has been issued by the H. B. Instrument Company. Included in the catalog are selector switches, anchor thermometers, photostats and differential temperature controls.

### Materials Handling Equipment

**Trailers .....25**

Fruehauf Trailers Co., Detroit, Mich., has released a leaflet showing various types of trailers. Descriptions, with detailed structural features, are included.

**Emptying Freight Cars.....26**

Hopper-type railroad cars are unloaded in as little as 90 seconds with a portable car shakeout device shown in Bulletin No. 128 from Robbins Conveyors, Inc.

**Lift Trucks .....27**

Handling boxes, sacks, cases and cans by lift truck is illustrated in a recent bulletin published by Towmotor Corp. Examples of palletized loads in the food industries are shown.

**Conveyor Belt .....28**

A new broadside on Griptop conveyor belt for difficult loads, including ice, has been published by B. F. Goodrich Co. The belt has a special non-skid cover.

**Conveyors .....29**

Special conveyor equipment for handling cartons is shown in a leaflet from the Lamson Corp. on materials handling.


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In many plants TARBONIS practically eliminated dermatitis resulting from the handling of a wide variety of foodstuffs, too long immersion of hands in brine, constant contact with acid-type foods, etc., during the war period. Let it aid your peace-time production. Effective in clearing up a high percentage of stubborn skin conditions encountered in industry . . . not merely a protective. Easy to apply—nothing to remove. Odorless, greaseless, stainless.

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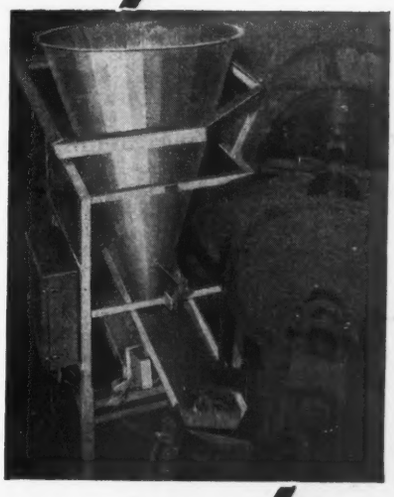

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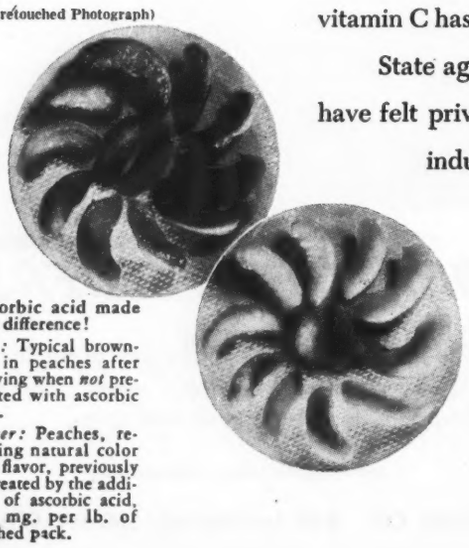
(Unretouched Photograph)



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# FOOD TECHNOLOGY

## NEW DISCOVERIES AND INVENTIONS

## FERMENTATION

### Method of Making High Strength Vinegar

IN the preparation and processing of pickled foods, a vinegar with a high acetic acid content is desirable, but with past methods it has been impossible to produce natural vinegar with more than 12½ percent acetic acid, as this is the extreme limit of acidity that vinegar bacteria can withstand. A process patented recently has as its object the production of a vinegar having an acetic acid content considerably higher than 12½ percent, yet employing substantially the same equipment now used in the manufacture of ordinary vinegar.

This invention consists in neutralizing the acetic acid produced by the fermentation of the mash to produce an acetate unharmful to vinegar bacteria. Alcohol is then added to restore the substrate upon which the bacteria acts so that the bacterial action can be repeated to produce more acetic acid. Neutralization of the produced acetic acid, followed by the addition of alcohol, is repeated often enough to insure the desired concentration of acetic acid. Thereafter, the mash is treated with a suitable reagent to free the acetic acid and the precipitated calcium sulphate is removed by filtration.

Digest from U. S. Patent 2,395,510, issued February 26, 1946, on an application dated January 12, 1944, to F. C. Silbernagel, and assigned to A. M. Richter Sons Co., Manitowoc, Wis.

## CEREALS

### Milling Process

IN the milling of flour from wheat or rye, some of the germ flattens out and goes with the shorts, while much is ground fine enough to go with the first and second clear flours. The germ contains oil, which is chiefly responsible for the sticky nature of low grade flours. The oil tends to become rancid, causing rancidity in the flour.

It is the object of a recent patent to provide a new and improved process for milling wheat and rye whereby the germ can be separated from the remainder of the berry before the germ is substantially ground. This is accomplished by moisture-conditioning the grain and subjecting it to an impacting action at the head-end of the mill to break away the germ from the endosperm prior to substantial grinding. The fines and largest particles are removed and the remainder crushed to flatten the germ while breaking up the endosperm to a greater extent and sifting the flattened germ from the crushed portions of the berries.

Digest from U. S. Patent 2,392,365, issued January 8, 1946, on an application dated May 11, 1942, to R. J. S. Carter, and assigned to Pillsbury Mills, Inc., a corp. of Delaware.

### Phosphatides in Coffee

FRESH green coffee beans contain a high percentage of phosphatides in the light-petroleum extract, as well as in the subsequent alcohol-benzene extract. They are practically all destroyed by roasting.

Coffees from Madagascar, Kenya, Cameroon, Brazil and Uganda were extracted repeatedly with light petroleum. When the oil had been removed the residues were extracted with alcohol-benzene (20-80). The extracts were analyzed for phosphatides. All types of green coffees contained phosphatides, while roasted coffees had, in all cases, lost most of their phosphatides. This seems to prove that roasting destroys phosphatides. The increase of oil in roasted coffees, over that in green coffees, is considerably higher than could be expected due to the loss of 20 percent moisture in roasting.

The caffeine extracted with alcohol-benzene crystallized out in a nearly pure state. In one case, the residual caffeine, left after extraction, was investigated and yielded only 0.18 percent caffeine. It seems probable that the alcohol-benzene would remove all the caffeine if the extraction were carried far enough.

## FREEZING

### Blanching Vegetables

ASCORBIC ACID content of cooked frozen vegetables depends more on the length of the frozen storage period than on the blanching method or the type of potable water used.

To test the effect of different types of potable waters on the vitamin content of vegetables processed for freezing, Thomas Laxton peas and Tendergreen snap beans were blanched in 4 types of water: (1) In distilled water, (2) water containing 500 p.p.m. of calcium carbonate and 100 p.p.m. of calcium sulphate, (3) water containing 0.25 p.p.m. of chlorine and (4) water containing one p.p.m. of iron.

Peas were blanched for 60 seconds in boiling water and beans for 2 minutes. Analyses were made for ascorbic acid, carotene, thiamine, riboflavin, niacin, calcium and iron immediately after blanching, after six months storage at 0 deg. F. and after cooking at the end of the storage period. Both peas and beans exhibited much the same results as far as vitamins and iron were concerned. There was no significant difference in the vitamin and iron content produced by blanching in hard, carbonated or iron containing waters.

| Type of coffee | Light petrol. extract percent | Phosphatides in the oil percent | Alcohol-benzene extract percent | Phosphatides in extract percent | Caffeine in alcohol-benzene extract percent |
|---|---|---|---|---|---|
| **Green Coffee** | | | | | |
| Kenya | 10.43 | 2.50 | 0.91 | 16.0 | 0.86 |
| Brazil | 6.05 | 1.47 | 2.44 | 3.9 | 0.65 |
| Cameroon | 9.47 | 2.50 | 1.17 | 9.7 | 0.74 |
| Uganda | 5.03 | 1.16 | 1.02 | 13.0 | 1.36 |
| Madagascar | 8.30 | 1.80 | 0.63 | 5.2 | 1.39 |
| **Roasted Coffee** | | | | | |
| Kenya | 13.13 | .... | 1.23 | 3.0 | 1.44 |
| Brazil | 9.38 | 0.40 | 2.50 | .... | 1.04 |
| Cameroon | 13.57 | .... | 1.43 | .... | 1.05 |
| Uganda | 8.88 | .... | 2.00 | 0.5 | 1.65 |
| Madagascar | 9.4 | 0.20 | 1.16 | 1.1 | 2.24 |

Digest from "The Phosphatides and Oil in Unroasted and Roasted Coffee Beans," by Bruno Rewald, *Oil & Soap*, vol. 23, 19-20, January, 1946.

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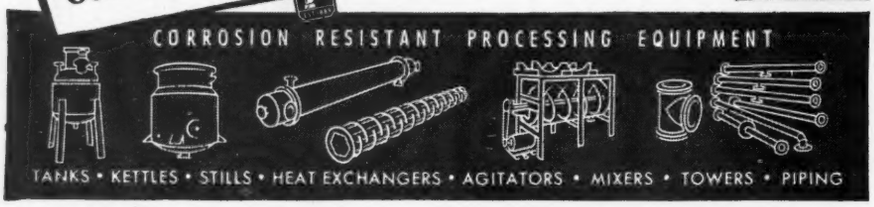



The calcium content of peas, while not lowered by blanching in distilled water, was increased from 188 p.p.m. to 289 to 325 p.p.m. by blanching in water containing 500 p.p.m. temporary hardness and 100 p.p.m. permanent hardness. Calcium content of beans was increased from 436 to 451 to 541 p.p.m. by the same water.

Digest from "Blanching of Vegetables for Freezing, Effect of Different Types of Potable Water on Nutrients of Peas and Snap Beans," by F. A. Lee and J. Whitcombe, *Food Research*, vol. 10, 465-68, November-December, 1945.

## FATS and OILS

### Phosphatides Retard Rancidity

ALTHOUGH not possessing direct antioxidant properties, vegetable phosphates retard rancidity when added to fats. The antioxygenic function of soy and similar phosphatides is attributed to the alcohol-insoluble kephalin fraction acting synergistically with other constituents, probably natural inhibitors, present in the commercial phosphatide preparations, or in the fats or in both. The inhibitory effect of kephalin apparently is inherent in the molecule as a whole and not in any portion thereof. Pure lecithin is inactive. Kephalin behaves as a monobasic acid, whereas lecithin is neutral.

Vegetable phosphatides are effective in different degrees in different types of fat, more so in cottonseed oil than in lard. It appears that the animal fats contain less of the natural inhibitors than vegetable oils. Small amounts of "soy lecithin," when added to refined glyceride fats impart to the latter greater stability and higher resistance to oxidation, a fact of importance in the production of edible fats and margarine. Exposure of the vegetable phosphatides to oxygen for 30 minutes at 149 deg. F. is said to destroy their antioxidant properties.

A mixture of alpha-tocopherol and a kephalin fraction derived from cottonseed increases the antioxidant effect three times. A similar synergistic reaction takes place between tocopheral and soy phosphatides in lard.

Soy phosphatides are equally and sometimes more effective when added to vegetable oils prior to deodorizing by prolonged heating at 392 deg. F. Although the phosphatides are destroyed at this temperature, their decomposition products retain their activity. The addition of phosphatides to shortening and frying

(*Turn to page* 188)

# on the whole rather bright"

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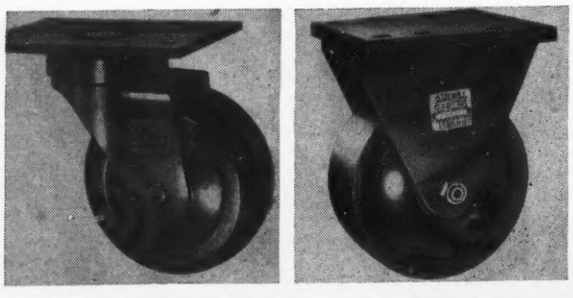

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fats before deodorizing reduces the possibility of introducing foreign flavors into edible products. In margarine, however, it is important that the antioxidant molecule is present in its entirety because it is needed for its emulsifying properties. Therefore, the above procedure is not recommended.

It is claimed that phosphatides derived from oils not containing linoleic acid (cotton-seed, corn) have superior antioxidant qualities and greater stability.

British experiments with groundnut phosphatides indicate that the addition of 0.1 to 0.2 percent of a commercial groundnut phosphatide imparts a stability to edible fats in the same manner and under the same conditions as soy phosphatides.

Phosphatides also stabilize vitamin A concentrates.

Digest from "Antioxidant Properties of Vegetable Phosphatides," by C. I. Bibby. *Food Manufacture* (London), vol. 20, No. 12, 441, 1945.

## DAIRY

### Casein From Milk Powder

WHEN tough casein, from skim milk powder, is required, it can be obtained by reconstituting the dried skim milk using fresh skim milk, with or without water, according to a recent patent. The claims cover specifically: Obtaining casein in the form of a firm curd from dried skim milk powder by mixing the dried skim milk with from 10 to 20 times its weight of fresh skim milk, precipitate casein with a casein-precipitating agent selected from the group consisting of acids, sour whey and rennet, and recovering the precipitated casein from the mixture.

Digest from U. S. Patent 2,388,991, issued Nov. 13, 1945, on an application dated Feb. 18, 1942, to W. F. Oatman, and assigned to Hercules Powder Company, Wilmington, Del.

### Brucella Abortus in Cheese

AN aging period of 60 days is reasonable assurance against the presence of *Brucella abortus* organisms in cheddar and limburger cheese, according to studies of New York State and Wisconsin cheeses.

Cheddar cheese was made from milk from a herd highly infected with brucellosis. The pathogens remained viable in all the cheeses made from such milk for three months but were negative in all tests on guinea pigs in one year. On 10 vats of commercial cheese milk made into limburger cheese, there were two vats positive for *Brucella abortus* with guinea pig inoculations. The curds

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made from the positive milk were negative and the cheese was negative at the end of 57 days storage.

Commercial lots of cheddar and limburger cheese obtained in *Brucella abortus* infected areas yielded no organisms in tests ranging from 41 to 84 days. It was pointed out that undulant and typhoid fever epidemics have not been attributed to cheese aged more than 63 days. The authors feel that an aging period of 60 days is reasonable assurance against the presence of viable *Brucella abortus* organisms in cheddar cheese.

Digest from "The Occurrence and Survival of Brucella Abortus in Cheddar and Limburger Cheese," by H. L. Gilman, A. C. Dahlberg and J. A. Marquardt, *Journal of Dairy Science*, vol. 29, February, 1946.

## VITAMINS

### High Ascorbic Acid Content

THE West Indian cherry *(Malpighia punicifolia L.)* is one of the richest edible fruit sources of ascorbic acid. Utilizing the assay method of Bessey and King it was found to contain from 1,000 to 3,000 mg. per 100 grams of edible matter. Variations seem due to degree of ripeness, the content being highest in the green fruit and lowest in the ripe.

Digest from "The High Ascorbic Acid Content of the West Indian Cherry," by C. F. Asenjo and A. R. Freire De Guzman, *Science*, Feb. 22, 1946.

### Stability of Carotene in Oils

SOLUTIONS of carotene in edible oils can be protected by addition of antioxidants, and protection can be afforded for periods well over a year without such special precautions as refrigeration, storage under nitrogen or in evacuated containers.

The relationship between stability of carotene and temperature was studied by the accelerated test. It consists of a determination of the time required for breakdown of 20 percent of the carotene in an oil solution stored as a thin layer at 167 deg. F. under specified conditions. Certain antioxidants that appeared to be effective at 167 deg. F. were tested at 77 and 104 deg. F. Oils used were: refined cottonseed and coconut oils and prime steam-rendered lard. Antioxidants were: l-ascorbyl palmitate, ascorbic acid, hydroquinone, phospholipid, nordihydroguaiaretic acid, alpha-tocopherol and Viobin, and combinations of the above. With most of the better antioxidants the protection found at the lower temperature was better than that indicated by the rapid test. Nordihydroguaiaretic acid and tocopherol were twice as effective at 77

*Here are the 27 food classifications in the Globe-Democrat's Grocery Audit*

*Package Laundry Soap*
*Bar Laundry Soap*
*Cake Flour*
*Dehydrated Soup*
*Chili Con Carne*
*Cleansers*
*Water Softeners*
*Bleaches*
*All Purpose Flour*
*Pancake Flour*
*Prepared Flour Mixes*
*Toilet Soap*
*Coffee*
*Instant Coffee*
*Dry Dog Food*
*Ready-to-Eat Cereals*
*Hot Cereals*
*Shortening*
*Margarine — Butter — Lard*
*Evaporated Milk*
*Peanut Butter*
*Baby Food*
*Baby Cereal Food*
*Catsup and Chili Sauce*
*Canned Soup*
*Desserts*
*Spiced Luncheon Meat*

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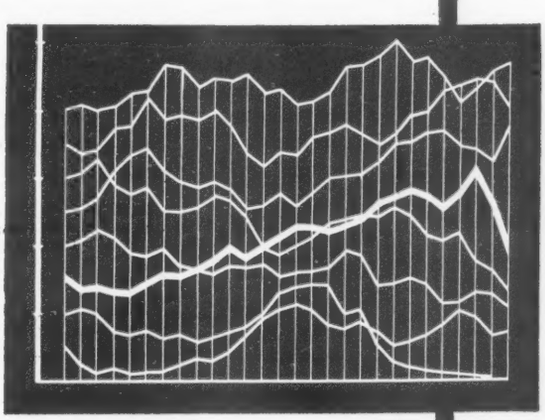

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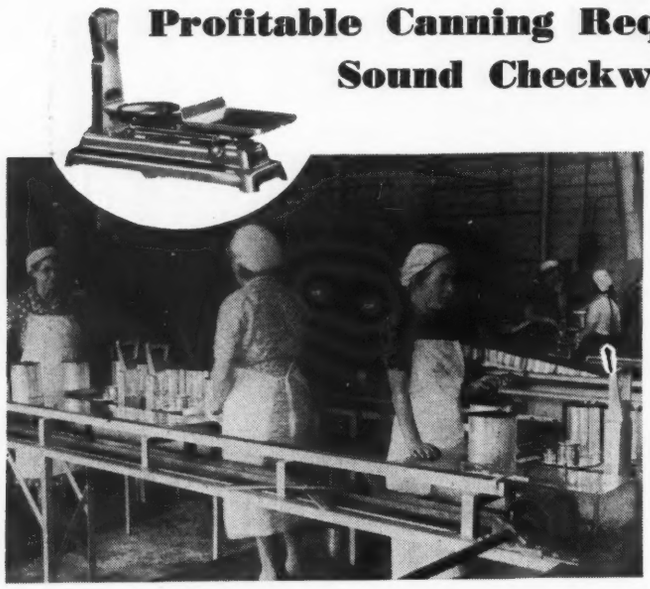
**Profitable Canning Requires Sound Checkweighing . . .**



*Sales & Service from Coast to Coast*

Are your cans 16 ozs. when sealed or 16½ ozs. or more? An average of one-half ounce for one container is negligible but one thousand containers mounts to 500 ozs. or 31.25 lbs. Multiply this overweight per working day in the year. If it is 260 days this half-ounce packaging leak per can will come to the staggering figure of 8,125 lbs. of product . . . your product lost in packaging leak. With losses of this proportion you sell your profit along with the goods. Sound checkweighing stops such losses and EXACT WEIGHT Scales are the answer. Write for the food processors catalog for full details.

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## by
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For many years the Sardik "Flash" Drum Drying process has been successfully drying acid fruits through especially designed stainless steel and glass preparatory and drying equipment.

Also, the technical skill of our staff has been improved and perfected by the processing of many millions of pounds of tomatoes during the past few years, to meet wartime needs.

The Sardik Drying process, because it dries quickly (about 15 seconds), retains, to a remarkable degree, the true color and flavor of the original fruit.

Powdered fruits are used in pudding, pie and ice cream dry mixes.

*Samples of fruit products will be sent on request.*

**Sardik Food Products Corporation**

**420 Lexington Avenue, New York 17, N. Y.**


deg. F. as would have been predictable from data obtained with the accelerated test. Many of the antioxidant combinations containing nordihydroguaiaretic acid or hydroquinone increased the stability of the carotene in cottonseed and coconut oils from less than four days without added inhibitor to well over a year by the addition of 0.05 percent of inhibitor.

The article is illustrated with charts and tables that show the relationship of storage temperature to stability values of the different antioxidants in the three oils.

Digest from "Stability of Carotene at Elevated and Room Temperatures," by E. Bickoff and K. T. Williams, *Oil & Soap*, vol. 23, 65-68, March, 1946.

## PACKAGING

### Apparatus for Packaging Food Products

STERILE, quickly perishable materials, such as milk, orange, grape or tomato juice, as well as other liquiform materials and solid products packaged in easily openable cans so as to keep the contents indefinitely, and performed economically and rapidly in a small area, is the subject of a recently patented invention.

According to the patent, the method comprises the steps of sterilizing and waterproofing empty containers by passing them through a sterilizing and waterproofing heated liquid bath, passing the containers directly into a sterile atmosphere, filling with food product in this atmosphere, applying closure and sealing same. Then the filled containers pass through a sterilizing washing bath and are repassed through the sterilizing and waterproofing bath on the way out of the sterilized chamber.

Digest from U. S. Patent 2,392,395, issued January 8, 1946, on an application dated August 22, 1942, to S. C. Lehman, Jersey City, N. J.

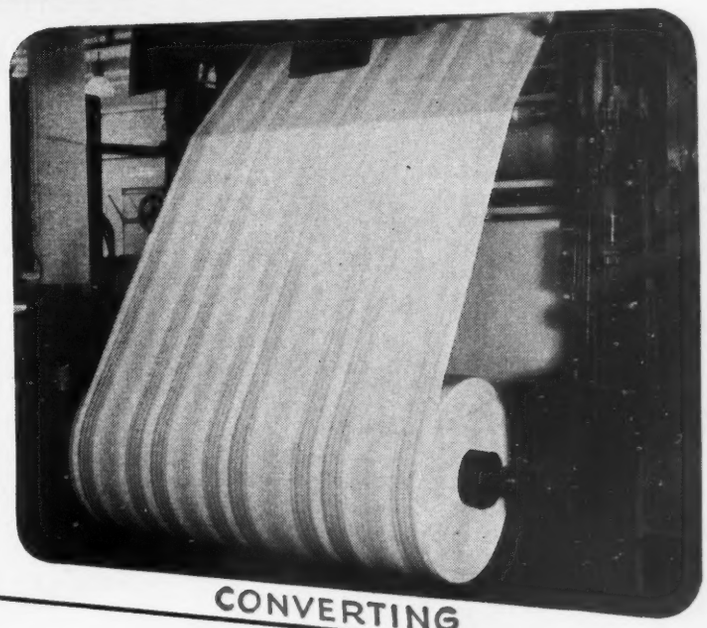
## FOOD CHEMISTRY

### Starch Determinations

A RAPID method for the determination of starch in corn, barley, rye, rice, grain, sorghum and buckwheat by means of the polarimeter has been developed. By extracting a factor-weight sample with calcium chloride solution of pH 2.2 to 2.5 (acetic acid), cooling, precipitating the proteins and filtering, a clear starch solution is obtained. The solution is polarized in 2 dm. tubes: Percent starch is ten times the polarimeter reading in degrees.

From the moment the woodsman's axe bites into the spruce tree . . . to the time the finished package is delivered to your plant . . . there are **hundreds** of individual factors that contribute to the protective and merchandising efficiency of that package. To you as a package buyer, it is of primary importance that Marathon combines all these "ingredients" of quality under **one** management . . . **one** integrated responsibility. By means of this integrated set-up . . . controlling all phases of supply, research, engineering, manufacture and service . . . Marathon "builds the package to fit the job" and delivers to you a consistently higher quality product.

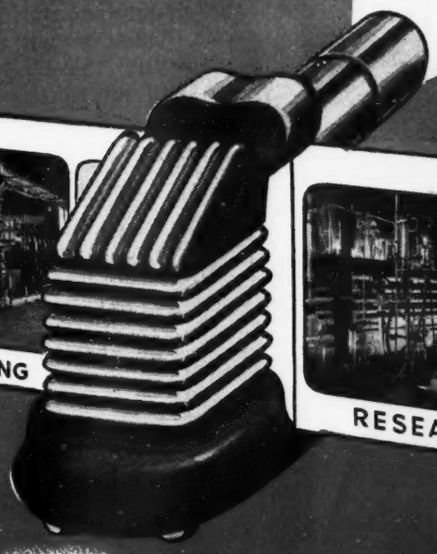
MARATHON CORPORATION
Menasha, Wisconsin

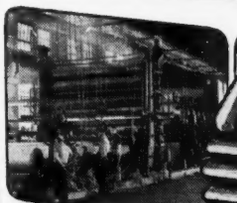


CONVERTING

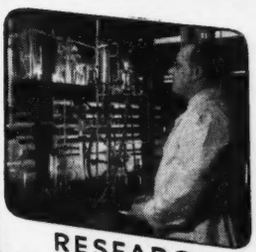
# Integrated Responsibility

## ASSURES YOU A HIGHER QUALITY PACKAGE

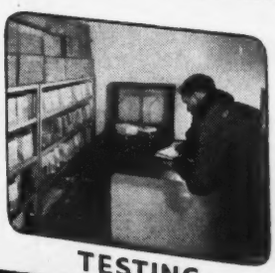




PAPER MAKING



RESEARCH



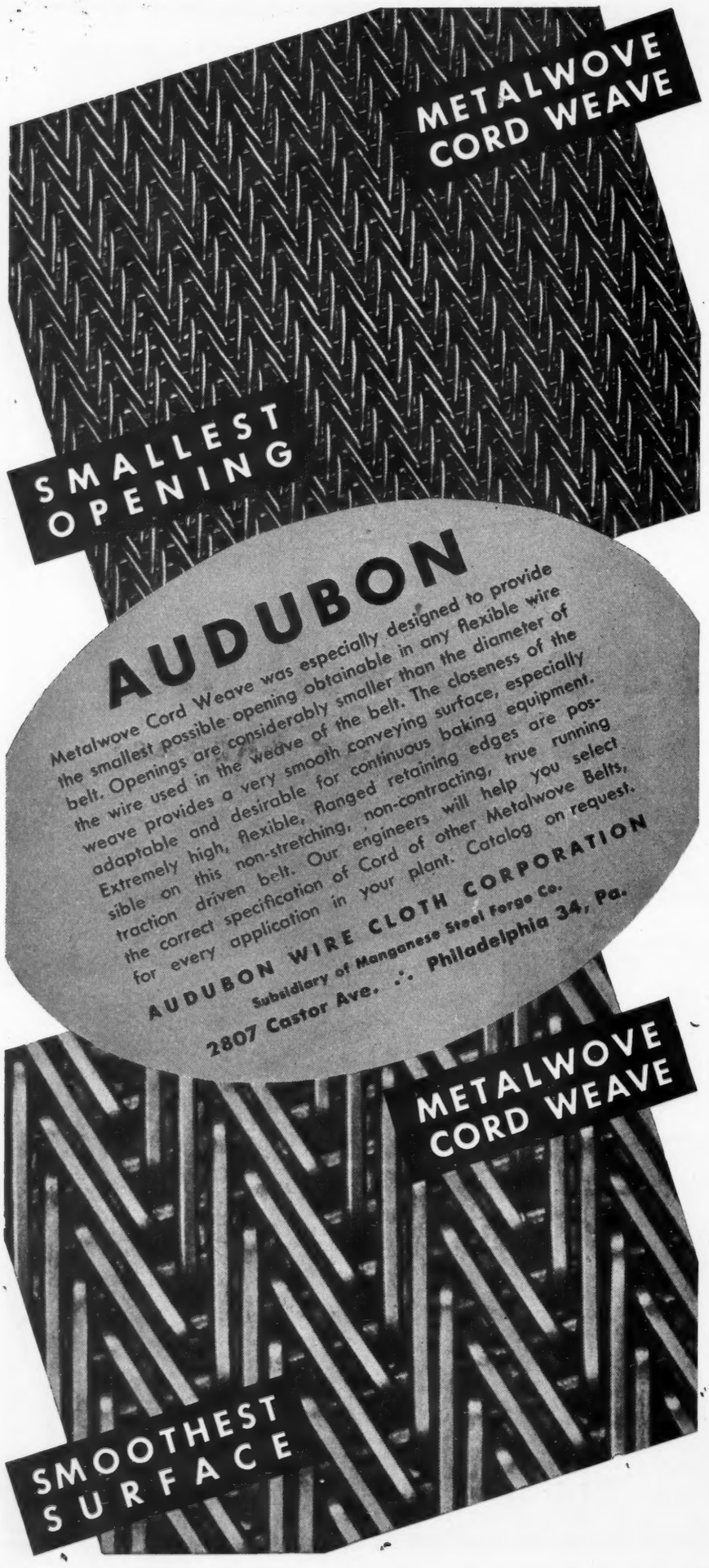
TESTING

DESIGN

*News about Marathon's pulp mill in Canada, now being built, will be announced soon.*

# MARATHON

First in Packaging for America's Foods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SURFACE

Soluble proteins are precipitated with stannic chloride or uranyl acetate dissolved in calcium chloride solution. The tin salt affects the specific rotation of starch but the uranyl acetate has no effect. Slight errors are introduced by either method of precipitation. Soluble hemicelluloses affect the starch readings as do liquid displacement and absorption by the insoluble solids. Free sugar and other optically active non-starch solubles contribute to the polarimeter reading. Total error from these sources should not exceed one percent.

Digest from "Polarimetric Determination of Starch in Cereal Products, IV. Critical Studies of Methods for the Determination of Starch in Whole Wheat, Granular and Patent Flours," by K. A. Clendenning, *Canadian Journal of Research*, vol. 23B, 239-59, November, 1945.

# DEHYDRATION

## Dehydrated Fat-Free Soup

DRIED SOUPS of the puree type, without added fat, are usually marketed in powder form. When reconstituted by the housewife, with boiling water, the powder is apt to lump unless constantly and carefully stirred. According to a recent patent, this difficulty can be overcome by making a dough of the ingredients, cooking the dough, extruding it into ribbons, flakes or cylindrical filaments, and drying these.

As an alternate method, part of the split peas, for example, can be blanched and steamed, then mixed, blended and ground. The steaming provides sufficient moisture to make the mix suitable for extrusion. The extruded material is dried to about four percent moisture.

Digest from U. S. Patent 2,391,829, issued Dec. 25, 1945, on an application dated Jan. 9, 1943, to L. J. Huber, and assigned to General Mills, Inc.

# SANITATION

## New Insecticides

GREATEST progress in pest control during recent years has been made in the field of synthetic organic insecticides. Outstanding examples of these developments are DDT, thiocyanates, dinitro derivatives, sabadilla and new methods of application (aerosols).

DDT, prepared by mixing monochlorobenzene with chloral hydrate in the ratio 2:1 in the presence of sulfuric acid, is soluble to different degrees in xylene, kerosene, stoddart solvent, ethyl alcohol and similar organic solvents. It is practically insoluble in water, but is effective in

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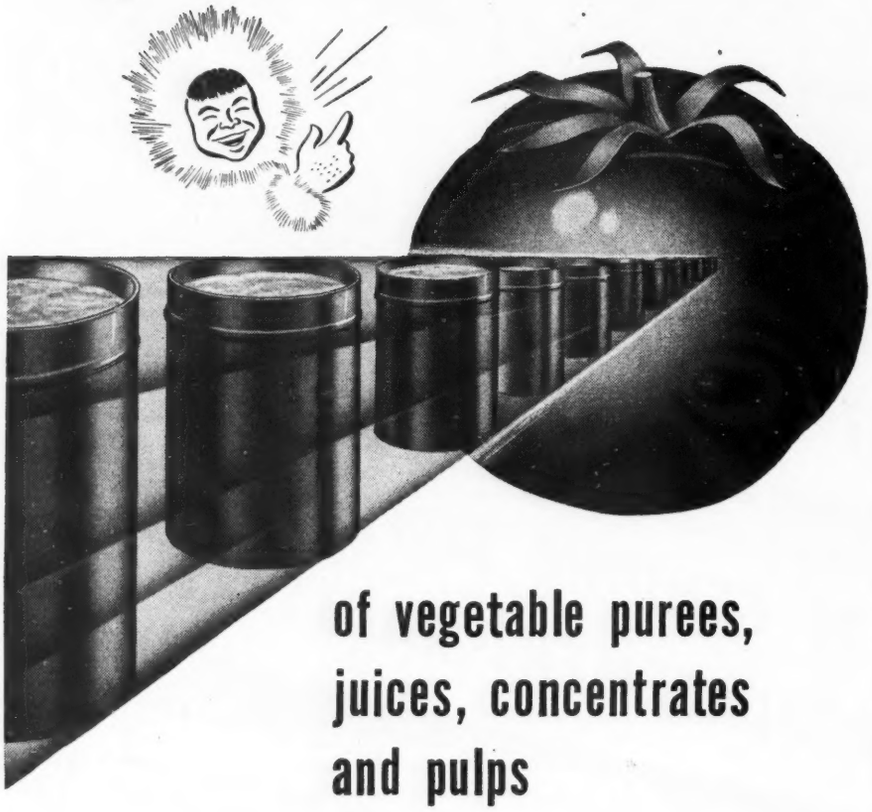
# speed the freeze



## of vegetable purees, juices, concentrates and pulps

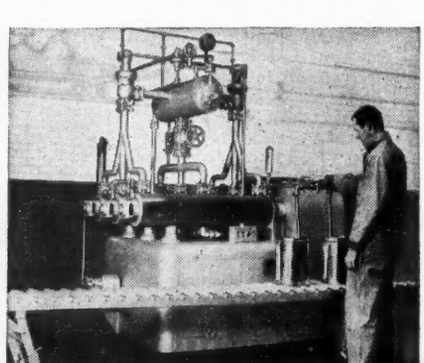
WHEN you do it with the VOTATOR, the containers of slush-frozen vegetable purees, juices, concentrates, or pulps go down a conveyor line on a continuous basis at the rate of some 3600 pounds per hour.

The temperature of the product is lowered in seconds *as it flows* through the improved heat transfer mechanism of this compact, self-contained, closed machine. One user reports that holding time, thereafter, for a solid freeze was cut from twelve hours at —10° or —20° F temperatures to only six hours at only 8° F.

Cost is cut, especially the cost of refrigeration. Uniform results are assured, fermentation and off-flavors are prevented. The natural qualities of the fresh vegetable—or fruit—are more completely retained.

In addition to vegetables such as tomatoes, beets, carrots, pumpkin, squash, the VOTATOR will slush-freeze fruits such as apples, peaches, oranges, grapes, berries, apricots, figs.

For performance data about your particular products, write to The Girdler Corporation, Votator Division, Dept. FI-5, Louisville 1, Kentucky. Branches: 150 Broadway, New York 7, N. Y.; 619 Johnston Bldg., Charlotte 2, North Carolina.



THE Votator
A GIRDLER PRODUCT

VOTATOR—*T. M. Reg. U. S. Pat. Off.*


aqueous suspensions. DDT acts as a nerve poison and, although not particularly selective in action, it is ineffective against a number of important insect pests. In food plants, DDT provides effective protection against such insects as flies, certain species of roaches and beetles.

DDT can be applied as a spray in water suspensions, in organic solvents, in emulsions, as well as in the form of aerosols and dusts. Sprays usually contain the active agent in concentrations of 2 to 5 percent, whereas dust mixtures may contain 1 to 10 percent with pyrophyllite and talc as diluents. In aerosols, the insecticide is combined with a liquefied gas, such as freon or methyl chloride, which upon release from the container evaporates, leaving the insecticide suspended in the air for long periods in very fine particles. Walls of warehouses and food plants may be protected for weeks or even months after application of DDT sprays due to their residual effect. Impregnated empty containers or grain bins remain insect free for long periods. However, it is not considered safe to use DDT in grain or cereal products intended for food. The toxic properties of DDT in various forms are not as yet fully evaluated, apparently brief contact with dust or aqueous suspensions have no serious effect. Caution must be exercised that inhalation and oral intake are avoided. Continued contact with organic solutions and oil emulsions may result in absorption and injury. Caution is also recommended with respect to residues on fruits and vegetables sprayed with DDT.

"Gammexane" (benzene hexachloride) is reported by British workers to be similar in effect to DDT. In concentration of 0.7 part per 1,000,000 parts of grain it was said to destroy granary weevils and roaches.

A mixture of 6 parts of dimethyl phthalate, 2 parts of indalone, and 2 parts of ethyl hexanediol or modifications of this combination act as repellent against blood sucking insects.

"Lethanes" (beta-beta-butoxythiocyanodiethyl ether) and "Thanite" (a mixture of fenchyl and bornyl thiocyanoacetates) were developed to replace rotenone and pyrethrum.

Dinitro derivatives are promising for the control of chinch bugs and other agricultural pests.

Sabadilla prepared by a new process has been greatly improved in toxicity for plant bugs.

Digest from "Some Recent Developments in Insecticides," by H. D. Tate, *Transactions American Association of Cereal Chemists*, Vol. 4, No. 2, 37, January, 1946.

# BOOKS

## Steel's Story

STEEL IN THE WAR. Published by United States Steel Corp., 71 Broadway, New York 6. 9x12 in.; 164 pages: paperboard. Free.

Here is a beautifully printed and handsomely illustrated story of the steel industry's performance during the war. The book traces the development of many new steels that will interest the food engineer. The perfection, for instance, of heat resisting steel tubes, the free-fall cargo package and the high pressure steam turbine, are among the many that will lend themselves to peacetime application.

For those who are keeping an eye on the opportunities presented by war impelled accomplishments in other industries, this book can be highly useful.

## Basic Electronics

ELECTRONS IN ACTION. By James Stokley. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18. 5½x8¼ in.; 320 pages; cloth. Price, $3.00.

With so many electronic applications being developed in the food industry, the food plant operator, along with the plant engineer, are becoming increasingly interested in this subject.

This book starts with an explanation of the basic concept of electron action and proceeds to explain many of its applications, while seldom going beyond the layman's technical range. The interesting history of electronic development that the author weaves through the book, is a further help to the reader in grasping the scientific significance of the subject.

## Dairy Economics

THE MILK INDUSTRY By Roland W. Bartlett. Published by The Ronald Press Co., 15 E. 26th St., New York. 6½x10¾ in.; 282 pages; cloth. Price, $4.50.

A full discussion of the economics involved in the production and distribution of milk has been undertaken in this book. The author has had the advantage of 20 years major research on the marketing of dairy products. He is thus in a position to effectively point out both the possibilities for future expansion and the dangers that now confront the industry.

Since the milk industry affects so many segments of our national economy—farmer, laborer, manufacturer, distributor and consumer—the facts here presented are important. And he draws conclusions on many controversial points, such as the danger of monopolistic tendencies, that should give all members of the industry a great deal to think about.

## Canning Material

TINPLATE. By W. E. Hoare and E. S. Hedges. Published by Longmans, Green and Co., 55 Fifth Ave., New York. 7¾ x10 in.; 292 pages; cloth. Price, $12.00.

Since tinplate is one of the principal food packaging materials, this book, written in England, should hold considerable interest for the canner. The chapter on corrosion has particular value for the food preserver. The story of the manufacture of tinplate, moreover, might help the canner in such tasks as estimating his probable supply. Tinplate consumes between 3- to 4,000,000 tons of steel per year and about 60,000 tons of tin. Of this amount, about half is used in food packaging.

# GOVERNMENT PUBLICATIONS

LIST OF AVAILABLE PUBLICATIONS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE, 1945. U. S. Department of Agriculture, Miscellaneous Publication No. 60. Available on request to U.S. Department of Agriculture, Washington 25, D.C.

REPORT OF THE SECRETARY OF AGRICULTURE, 1945. Available from Superintendent of Documents, Washington 25, D.C. Price, 30 cents.

HIGH-LEVEL FOOD CONSUMPTION IN THE UNITED STATES. By Willard W. Cochrane. U.S. Department of Agriculture, Miscellaneous Publication No. 581. Available from Superintendent of Documents, Washington 25, D.C. Price, 10 cents.

THE BALANCE SHEET OF AGRICULTURE, 1945. By Alvin S. Tostlebe, Donald C. Horton, Roy J. Burroughs, Harold C. Larsen and Lawrence A. Jones. U.S. Department of Agriculture, Miscellaneous Publication No. 583. Available from Superintendent of Documents, Washington 25, D.C. Price, 10 cents.

NUTRITIVE PROPERTIES OF PORK PROTEIN AND ITS SUPPLEMENTAL VALUE FOR BREAD PROTEIN. By Ralph Hoagland. N. R. Ellis, O. G. Hankins and G. G. Snider. U.S. Department of Agri-


WATER FOR FOOD PROCESSING STERILIZED BY BREAK-POINT CHLORINATION

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culture, Technical Bulletin No. 906. Available from Superintendent of Documents, Washington 25, D.C. Price, 5 cents.

POSTWAR PACKAGES AND CONTAINERS FOR MARKETING FOODS. By Delbert R. French. Unnumbered mimeographed. Available on request to Bureau of Agricultural Economics, Washington 25, D.C.

DIRECTORY OF THE MEAT INSPECTION DIVISION. U.S. Department of Agriculture, Production and Marketing Administration. Unnumbered printed. Available from Superintendent of Documents, Washington 25, D.C. Price, 10 cents.

1946 AGRICULTURAL OUTLOOK CHARTS. Unnumbered multilithed. Available on request to Production and Marketing Administration, Department of Agriculture, Washington 25, D. C.

FISH AND SHELLFISH OF THE MIDDLE ATLANTIC COAST. By Rachel L. Carson. U.S. Department of the Interior, Conservation Bulletin No. 38. Available from Superintendent of Documents, Washington 25, D.C. Price, 10 cents.

DISTRIBUTION COST ANALYSIS. By Charles H. Sevin. Bureau of Foreign and Domestic Commerce, Economic Series No. 50. Available from Superintendent of Documents, Washington 25, D.C. Price, 15 cents.

VITAMIN A IN BUTTER. Department of Agriculture Miscellaneous Publication No. 571. Available from Superintendent of Documents, Washington 25, D. C. Price 10 cents.

CRACKERS AND COOKIES. Federal Specification, EE-C-651b. Available from Superintendent of Documents, Washington 25, D. C. Price 5 cents.

HANDLING AND STORING CORN ON THE FARM. Department of Agriculture Farmers' Bulletin No. 1976. Available from Superintendent of Documents, Washington 25, D. C. Price 5 cents.

MANUAL OF FIRE-LOSS PREVENTION OF THE FEDERAL FIRE COUNCIL. (Supersedes National Bureau of Standards Handbook H 19). Public Buildings Administration. Unnumbered. Available from Superintendent of Documents, Washington 25, D. C. Price, 30 cents.

SURFACE WATER TEMPERATURES PACIFIC COAST. Unnumbered. Available on request to U. S. Coast and Geodetic Survey, Department of Commerce, Washington 25, D. C.

SIZE OF SMALLEST DUST PARTICLES REVEALED BY VARIOUS MICROSCOPIC SYSTEMS. By Carlton E. Brown and Florence L. Feicht. Bureau of Mines Report of Investigations R.I. 3821. Mimeographed. Available on request to Bureau of Mines, Washington 25, D. C.

# PATENTS

### BAKING

**Bread and Like Baked in Traveling Tray Oven Equipped With Transverse Endless Unloading Conveyor Running Through Wall Of Oven and Positioned To Give No Interference With Loading Operation**—John V. Cook, Wilmette, Ill. to The Petersen Oven Co., Chicago, Ill. No. 2,397,726. Apr. 2, 1946.

### BEVERAGES

**Cocoa and Milk Beverage Processed to Permit Marketing in Hermetically Sealed Containers**—John M. Jackson, Chicago, Ill. to American Can Co., New York, N. Y. No. 2,396,265. Mar. 12, 1946.

### CEREALS

**Cocoa Beans Acidulated, Roasted, Neutralized and Further Roasted To Increase Water Soluble Non-Toxic Constituents**—Leon C. Benedict, Mansfield, Mass. to United-Rexall Drug Co. No. 2,397,402. Mar. 26, 1946.

**Decolorizing Protein Prepared From Soybeans**—Merrill A. Youtz to The Drackett Co., Cincinnati, Ohio. No. 2,397,307. Mar. 26, 1946.

### DAIRY

**Butter Made in Continuous Flow Vertical Churn** — Albert C. Hougland and Glen S. Hougland, New York, N. Y. No. 2,397,488. April 2, 1946.

**Butter Made Into Individual Service Curls or Rolls by Mechanical Means**—Ted Bauman, Milwaukee, Wis. No. 2,395,797. Mar. 5, 1946.

### ENGINEERING

**Fish Unloaded From Boats By Means of Centrifugal Suction Pump Without Damage to Fish**—John D. Toft, South Portland, Me. No. 2,396,305. Mar. 12, 1946.

### FATS AND OILS

**Antioxidants Recovered From Fatty Materials With Which They Are Naturally Associated**—Loran O. Buxton, Belleville, N. J. to National Oil Products Co., Harrison, N. J. Nos. 2,396,680 and 2,396,681. Mar. 19, 1946.

**Fatty Oils Freed of Oil-Soluble Protein By Treatment With Proteolytic Enzyme In Presence of Water**—Katherine Lloyd, Chicago and Havard L. Keil, Clarendon Hills, Ill. to Armour & Co., Chicago, Ill. No. 2,397,874. Apr. 2, 1946.

**Raw Castor Oil Modified By Treating With 5 to 20 Percent Maleic Anhydride at 95 to 140 Deg. C. for One Hour**—Harry M. Ullmann, Bethlehem, Pa. No. 2,396,763. Mar. 19,1946.

**Vegetable and Animal Oils Made Easily Emulsifiable**—Abraham Moscowitz, Nutley, N. J. to L. Sonneborn Sons, Inc. No. 2,396,718. Mar. 19, 1946.

**Fish Protected From Red Bacillus By Uniform Addition Of Finely Divided Particles Of Acid Phosphate To Salt Used**—Herbert Hempel, deceased, by Herbert K. Hempel, Administrator, Essex, Mass. to Gorton-Pew Fisheries Co., Ltd., Gloucester, Mass. No. 2,397,547. Apr. 2, 1946.

### PACKAGING

**Cheese Wrapped in Mold Inhibiting Two-Ply Woven Textile Bandage**—Ross C. Whitman, Walpole, Mass. to Kendall Co., Boston, Mass. No. 2,396,905. Mar. 19, 1946.

### STARCH

**Corn Syrup Made From Starch by Acid Hydrolysis Without Bitterness**—George T. Peckham, Jr. to Clinton Co., Clinton, Iowa. No 2,395,907. Mar. 5, 1946.

**Corn Syrup Made From Starch By Acid Hydrolysis to Contain Dextrose, Maltose, and Other Intermediate Conversion Products in Excess of 50 Percent Total Dextrose Equivalent Without Crystallization of Dextrose**—George T. Peckham, Jr. to Clinton Co., Clinton, Iowa. No. 2,395,938. Mar. 5, 1946.

**Partially Converted Starch Roasted To About 300 Deg. F. With Formaldehyde or Acetaldehyde to Form Granular, Substantially Ungelatinized Starch Product**—Hans F. Bauer, Chicago, Jordan V. Bauer, Elmwood Park, and Don M. Hawley, Geneva, Ill. to Stein, Hall & Co. Inc., New York, N. Y. No. 2,396,937. Mar. 19, 1946.

### VITAMINS

**Undesirable Tastes and Odors Removed From Fat-Soluble Vitamin Concentrates Obtained From Fish Oils, Fish Liver Oils and Mixtures With Crude Vegetable Oils**—Loran O. Buxton, Belleville, N. J. to National Oil Products Co., Harrison, N. J. No. 2,396,679. Mar. 19, 1946.

### MISCELLANEOUS

**Skimmed Milk Powder Added to Potato Starch in Water Suspension, Gelatinized and Dried to Form Products Containing Not Less Than 5 Percent Milk Solids Based on Weight of Starch Used**—Fredrik Andre Moller, Haren, Netherlands to Alien Property Custodian. No. 2,396,592. Mar. 12, 1946.

**Water Dispersion of Wetting Agent Added to Peanut Butter to Reduce Stickiness**—Joseph L. Rosefield, Jerome M. Rosefield and Marvin Rosefield, Alameda, Calif. No 2,397,564. Apr. 2, 1946.

**Yeast Suspension Dewatered in Rotatable Drum Under Superatmospheric Gas Pressure**—Sven Olof Rosenquist, Rotebro, Sweden to Svenska Jastfabriks Aktiebolaget, Stockholm, Sweden. No. 2,397,436. Mar. 26, 1946.


# BASIC FLAVOR MATERIALS

***For Food Products Manufacture***

**SOLID EXTRACTS**

ST. JOHNS BREAD
SWEET ORANGE PEEL
LICORICE
COFFEE
FOENUGREEK
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MAPLE BASE

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GINGER
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TONKA

Essential Oils
Aromatic Chemicals

Gums: Tragacanth, Arabic
Karays, Locust

Spices

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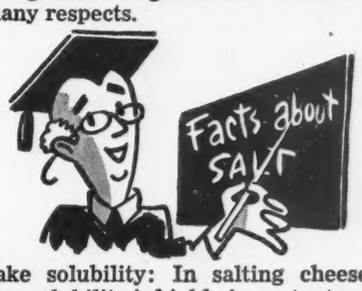
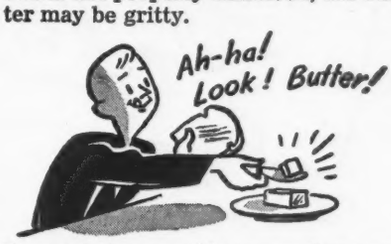
# TELL US MORE
## *Teacher!*

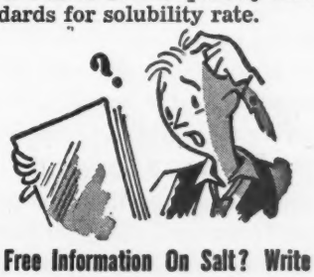
● Maybe you're like a lot of food technologists and salt buyers who have gone along thinking all salt is the same. Actually, of course, various brands and grades and grains of salt differ in many respects.




Take solubility: In salting cheese, slow solubility is highly important and desirable. Otherwise, salt is lost in the whey, producing flat, under-salted cheese. On the other hand, in salting butter, salt must dissolve with lightning speed. If the butterfat is on the soft side—lacking in body—at certain seasons, butter salt must dissolve so quickly that over-working is avoided. Otherwise, the butter may lose its desirable physical properties and become mottled or marbled—and may lose its moisture, become leaky. Yet, if the salt is not properly dissolved, the butter may be gritty.




To meet these problems, we have set up definite solubility standards for Diamond Crystal Salt. Our Butter Salt, for example, dissolves completely in water at 65° F. in less than 9.8 seconds—average rate, 9.2 seconds. That is why so many quality-minded food processors have learned to depend on Diamond Crystal products, manufactured under strict quality-control standards for solubility rate.



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If salt solubility enters into your processing, write to our Technical Director. He will gladly recommend the correct Diamond Crystal Salt for best results. Diamond Crystal, Dept. J-12, St. Clair, Michigan.

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## Ham and Sweet Potatoes

(*Continued from page* 94)

tion runs, the constituents were mechanically premixed, filled into the cans with no added moisture, closed under atmospheric pressure and retorted at 235 deg. F. That procedure resulted in some discoloration and scorching of the ham. When the premixing was eliminated, the constituents of the mix layered in the cans, and the cans closed under vacuum, those objectionable effects of retorting were practically eliminated. For packing a 34-oz. can the corrected procedure is similar to that of an assembly line.

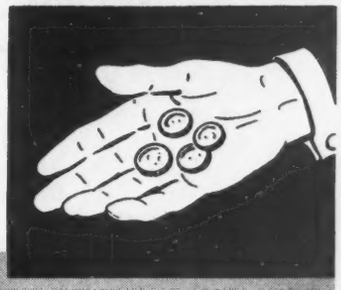
As the can moves along the filling line, 13 oz. of ham are filled into the bottom of the can. Four ounces of dehydrated sweet potatoes are then placed on top of the ham and 4 oz. of sugar are scattered over the potatoes to give a fairly even distribution of the sugar in the can. Thirteen ounces of ham complete the pack, making a net weight content of 34 oz. This pack, with the ham on each end and the potatoes and sugar in the middle, insures rehydration of the potatoes, regardless of which end of the can is up during the cook in the retort.

From the filling lines the cans are taken by an endless conveyor to an automatic vacuum closing machine. The degree of vacuum drawn on the cans depends somewhat upon the temperature of the meat. In any case, the maximum that the can will withstand without collapsing is desirable. In this way, the oxygen content of the can is reduced sufficiently to avoid the oxidized discoloration which is found to be present when the cans are exhausted by steam and closed under atmospheric pressure. Another precautionary detail has to do with the rapidity of heating in the retort.

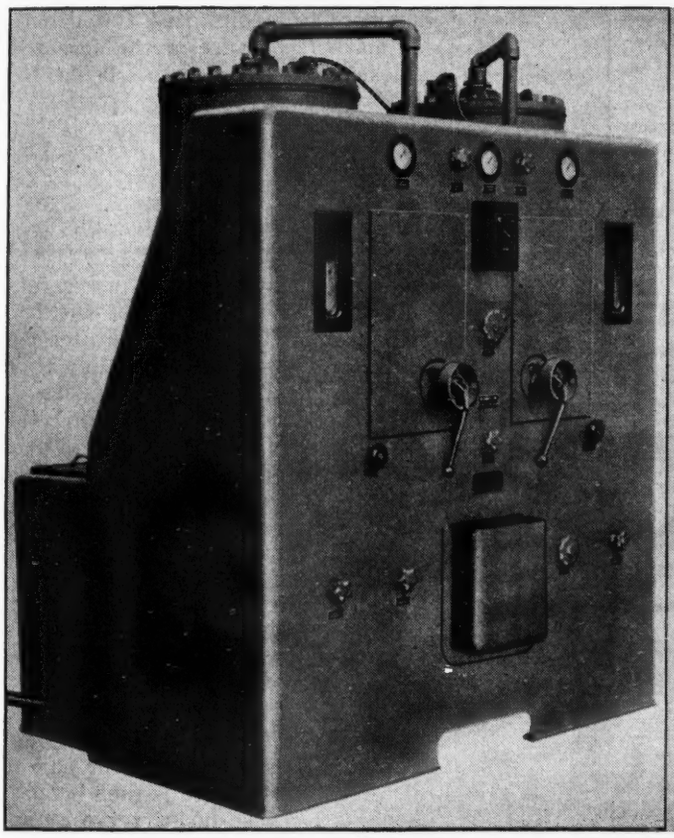
When the temperature of the retort is brought up quickly, as is done with the majority of commercially canned products, the ham invariably scorches on those surfaces in direct contact with the inside of the can surface. When the temperature of the retort is carried at about 200 deg. F. until the surface protein of the ham begins to coagulate and water is forced from the tissue, this condition is largely eliminated. However, in actual production, retort capacity does not always permit this. Preheating in a hot water bath before retorting gives identical results. Time of retorting is dependent upon whether the preheating is done in the retort or in a hot water bath and

# "We used to spend *this* for WATER...

# ...NOW we spend *this*..."



*(Typical report from D-I System users)*



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**The Dorrco D-I System is being used effectively for such purposes as:**

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**HOW CAN *YOU* GET FULL FACTS?** The D-I System is another result of Dorr research into better industrial processing methods. Dorr service extends from analysis in the field to supervision of erection and initial operation. A Dorr engineer will gladly give you detailed information on the D-I System as applied to your process. There is no obligation. Phone, wire or write your nearest Dorr office.

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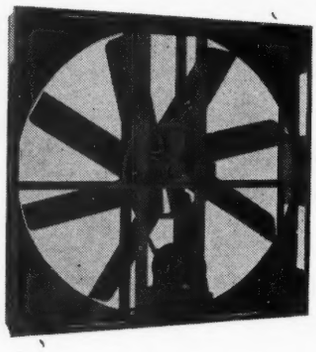

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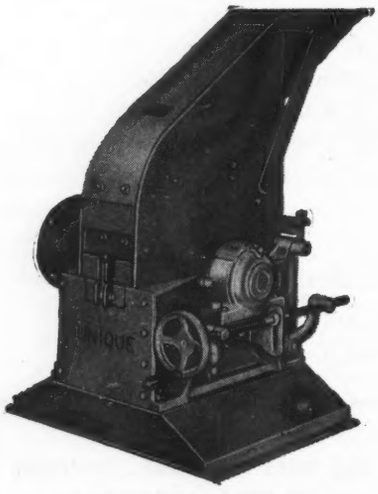

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how the cans are loaded into the retort. A safe range is from 3 to 3½ hours at 235 deg. F.

Cooling of the cans is carried out in the retorts at the end of the cooking period by filling the retorts with deep well or tap water under pressure. Residual heat in the cans after the cooling operation is sufficient to dry the cans for labeling or for storing without danger of rust formation.

The finished product is at its best for eating when heated in the can and emptied directly into the serving dish. In addition to its close duplication of the freshly cooked home-prepared dish, canned ham and candied sweet potatoes, as prepared by the described procedure, suggests commercial possibilities for domestic markets because of the ease and quickness in which it can be heated and served.

*—End—*

## Grating Cheese

(*Continued from page* 103)

individual curd particles upon rubbing between the palms of the two hands, it is then ready for dipping. The curd is stirred during the entire cooking period to prevent matting.

7. The whey is removed and the curd trenched as soon as possible to facilitate draining of the whey, but as soon as the whey is removed the curd is stirred and trenched alternately to prevent matting and to facilitate further drainage of whey. This is done for 15 to 20 minutes. Matting should be prevented.

8. After 15 to 20 minutes of stirring and trenching for drainage, 2 lb. of salt for each 1,000 lb. of milk, are added to the curd while stirring. The curd is stirred until the salt is dissolved. The cheese is then hooped. Longhorn cheese hoops serve as excellent hoops for this cheese. No bandages are necessary. Considerable pressure is given the cheese while in the press.

9. The next day the cheese is removed from the hoops and placed in a 60 deg. F. room. Then, the cheese is salted by the dry method until it takes up enough salt to give approximately five percent in the finished product. This means the addition of another 3 to 3½ percent salt, since about two percent was added before hooping.

10. When the salt is all taken up, the surface of the cheese is rubbed with mineral oil and black pepper, every month or so, to keep the surface from drying out and cracking.

11. The cheese is cured at 60 deg.

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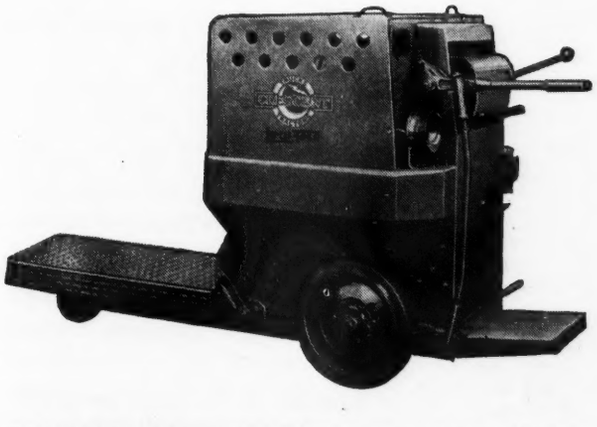

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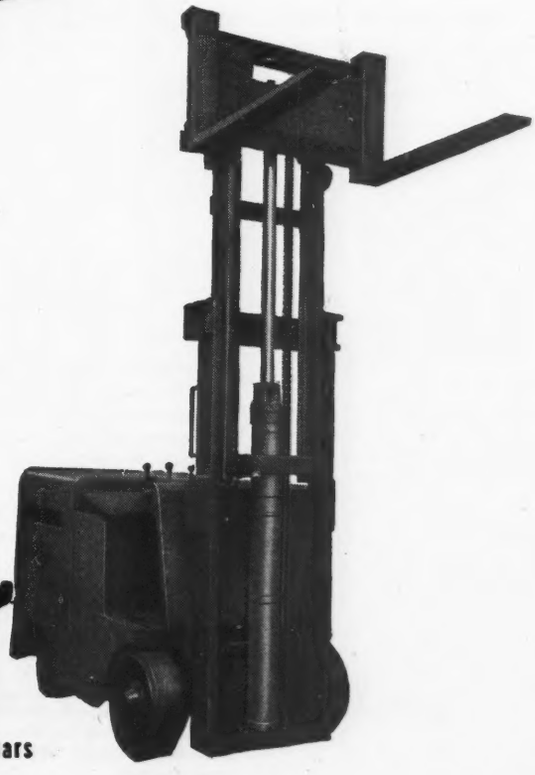

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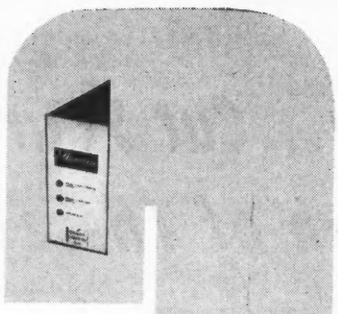

**Coumarin Monsanto,** a synthetic odor principle, used to enhance the bouquet of soaps and perfumes; also to amplify the more delicate aroma of vanillin.

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If you use synthetics to impart flavor, add intriguing odors, accent aroma, or as a fixative — get in touch with Monsanto. Contact the nearest Monsanto office, or write MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second St., St. Louis 4, Missouri. District Offices: New York, Chicago, Boston, Detroit, Cincinnati, Charlotte, Birmingham, Los Angeles, San Francisco, Seattle, Montreal, Toronto.

*Reg. U. S. Pat. Off.*

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F. until the desired flavor is present, then it may be used or removed to a colder room. The humidity should be low to keep the cheese from becoming pasty.

The above method has resulted in cheese of a high, piquant flavor and good grating qualities. One lot of cheese was cured at 60 deg. F. for four months, and then removed to a 50 deg. F. room. The humidity of the 50 deg. F. room was higher than that of the 60 deg. F. room and the cheese took on moisture which interfered with the grating properties. The humidity should not be over 80 percent in any case.

The composition of the cheese should be about as follows:

| | |
|---|---|
| Fat | 27 percent |
| Moisture | 26-28 percent |
| Salt | 5.5-6. percent |
| pH | 5.2-5.7 |
| Acid No. | 4.37[2] |

**References**

[1] C. A. Phillips. Romano Type Cheese. National Butter & Cheese Journal, Vol. 34, No. 6, p. 13, June, 1943.

[2] Acid No. is equivalent to the number of mls. of N/10 NaOH required to neutralize the fatty acids extracted with petroleum ether from 5 grams of sample.

*—End—*

## Fruit Browning Preventing

(*Continued from page* 106)

¼ in. sliced apples on a laboratory scale. Exact values will probably vary with type, variety of fruit and plant practice. While indicating the general nature of the relationships, these data will have to be individually interpreted according to plant practice and fruit handled.

### Dry Acids With or Without Sugar

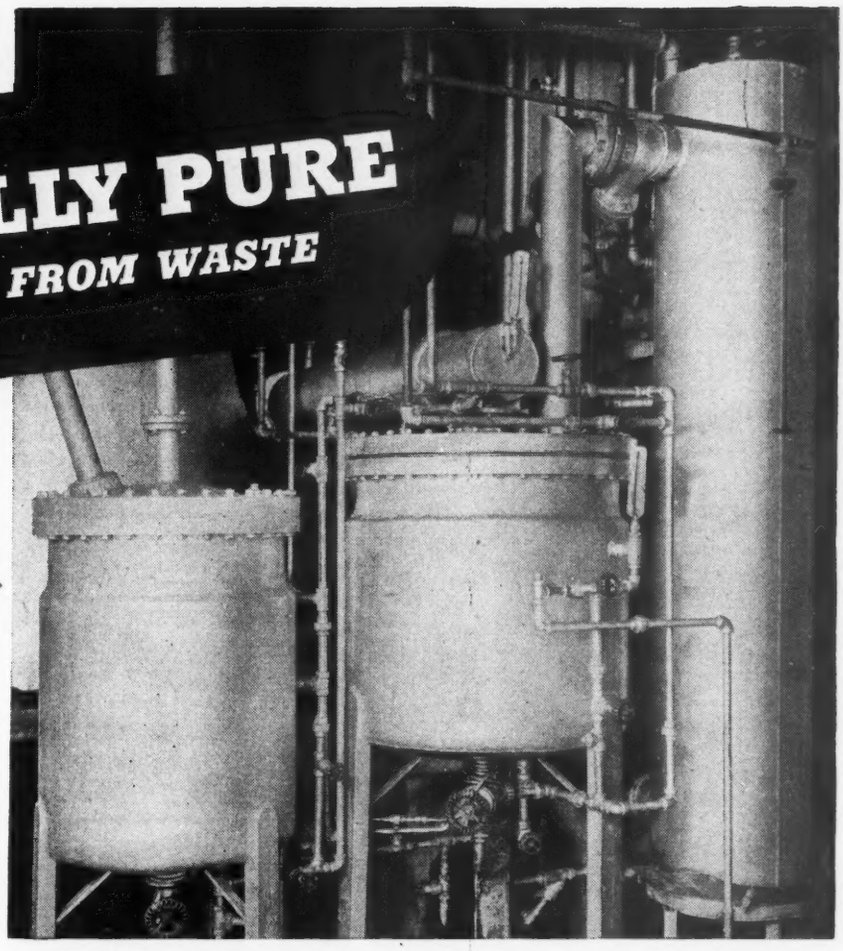
Cut fruit has been treated with powdered citric and ascorbic acids and found to be an entirely satisfactory method of application. The retention of added ascorbic acid when apples so treated are allowed to stand in the air for 24 hours is shown in Fig. 2. The application of citric and ascorbic acids by this means, or when both acids have been applied by dipping, yield excellent retention values.

### Addition of Ascorbic and Citric Acids Through Sirup

When ascorbic acid is added as a solution its losses can be attributed to two factors: (1) the destruction, which is catalyzed by the enzymes naturally present in the fruits, and (2) by the inevitable air oxidation of solutions of ascorbic acid. In the dry states, ascorbic acid is stable, but its solutions are slowly decomposed by atmospheric oxidation. When added to the fruit in a solution, either in dipping baths or pres-

# CHEMICALLY PURE

## ...yet DISTILLED FROM WASTE



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Harmful metallic pick-up and discoloration is prevented by nickel's high corrosion resistance. That's one reason why nickel is so widely used for handling such products as caustic soda and caustic potash, phenol, ethyl cellulose, phosphorous oxychloride and many other reagents, solvents and intermediates.

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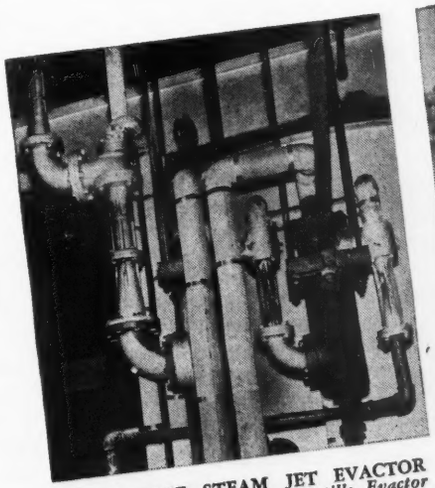
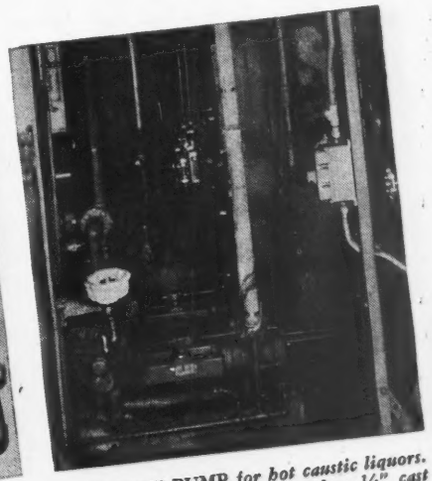
PURE NICKEL STILLS *used in recovery of crude vanillin and subsequent purification distillations. Fabricated from 5/32" nickel sheet, these stills were installed in 1938. Their present excellent condition indicates many more years of service ahead.*



FOUR-STAGE STEAM JET EVACTOR *for pulling vacuum on nickel stills. Evactor unit is equipped with Monel steam nozzles and throats to withstand erosive action of steam with an orifice velocity of 4000 feet/second at pressures approximating 600 psi and temperatures as high as 800° F.*



"DONKEY" PUMP *for hot caustic liquors. This pump was equipped with a 1/4" cast nickel liner about 2½ years ago and has not required replacement since. Ordinary pumps in this service needed complete replacement every six weeks.*

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ent in sugar sirups, the question arises of how to minimize the loss during the handling of these solutions.

It is possible to eliminate the first and greatest cause of loss of ascorbic acid, namely, the enzymatically catalyzed destruction, by the inactivation of the enzymes with citric acid. It has been found that the presence of citric acid will also materially assist in minimizing the second cause of destruction, namely, the atmospheric oxidation of ascorbic acid solutions. This is shown in Fig. 7.

The addition of citric acid to sugar sirups containing ascorbic acid has a pronounced effect in increasing their stability, and it would seem a desirable procedure to add some citric acid when ascorbic acid is added to the fruit with sugar sirup. If sirup is chosen as the vehicle for applying the ascorbic acid, it may be desirable to dip the fruit directly into a citric acid solution, where its effect can be concentrated in activating the enzymes, and add the remainder of the citric acid to the sirup to increase the stability of the ascorbic acid.

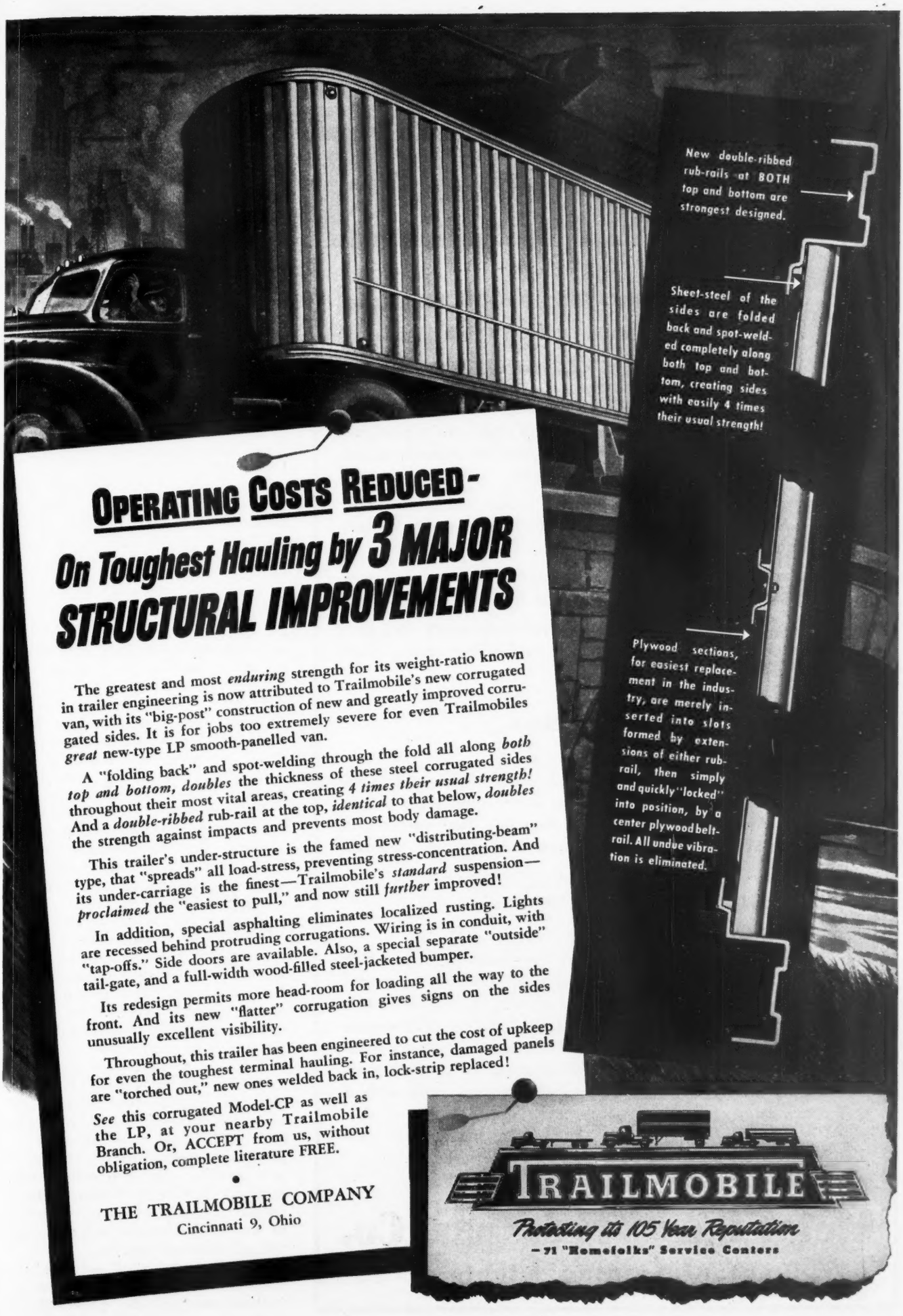
### Protective Action of Sirup

An examination of Fig. 8 shows that citric acid, when added to water solutions, materially reduces the destruction of ascorbic acid due to atmospheric oxidation. A comparison of the stability of ascorbic acid with regard to atmospheric oxidation in sugar sirups and water solutions, shown in Figs. 7 and 8, indicates that at higher pH values, 3.3, sugar has a marked protective action. This protective action is not apparent at lower pH values, since at a pH of 2.15 the stability of ascorbic acid in aqueous solution has been so increased, by the added acids, that it seems to be almost identical with that of sugar sirups.

The data on destruction of ascorbic acid in sugar and water solutions were made under greatly accelerated conditions in order to study these effects experimentally. The rate of decomposition under normal processing conditions will only be a small fraction of that for accelerated conditions.

These data show that by adding citric acid it is possible to decrease markedly the destruction of the ascorbic acid added to fruit as an antioxidant, and so increase its efficiency making it possible to reduce the quantities necessary.

The quantity of ascorbic acid required is related to the amount of citric acid that can be used. This is


New double-ribbed rub-rails at BOTH top and bottom are strongest designed.
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The greatest and most *enduring* strength for its weight-ratio known in trailer engineering is now attributed to Trailmobile's new corrugated van, with its "big-post" construction of new and greatly improved corrugated sides. It is for jobs too extremely severe for even Trailmobiles *great* new-type LP smooth-panelled van.

A "folding back" and spot-welding through the fold all along *both top and bottom, doubles* the thickness of these steel corrugated sides throughout their most vital areas, creating *4 times their usual strength!* And a *double-ribbed* rub-rail at the top, *identical* to that below, *doubles* the strength against impacts and prevents most body damage.

This trailer's under-structure is the famed new "distributing-beam" type, that "spreads" all load-stress, preventing stress-concentration. And its under-carriage is the finest—Trailmobile's *standard* suspension—*proclaimed* the "easiest to pull," and now still *further* improved!

In addition, special asphalting eliminates localized rusting. Lights are recessed behind protruding corrugations. Wiring is in conduit, with "tap-offs." Side doors are available. Also, a special separate "outside" tail-gate, and a full-width wood-filled steel-jacketed bumper.

Its redesign permits more head-room for loading all the way to the front. And its new "flatter" corrugation gives signs on the sides unusually excellent visibility.

Throughout, this trailer has been engineered to cut the cost of upkeep for even the toughest terminal hauling. For instance, damaged panels are "torched out," new ones welded back in, lock-strip replaced!

*See* this corrugated Model-CP as well as the LP, at your nearby Trailmobile Branch. Or, ACCEPT from us, without obligation, complete literature FREE.

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We endeavor to have a supply of stock sizes in San-I-Tanks on hand at all times. We have a tank for every application and in any size you need. Write us giving complete data on the size tank you need and we will, in many cases, have the tank in stock.

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In addition to our complete line of stock sizes in San-I-Tanks which are stocked for immediate shipment, we also manufacture special sizes built to your requirements. If you have a special tank problem get in touch with us and our engineers will be glad to give you their suggestions. No obligation of course. It it's a tank problem we can solve it for you. Over 20 years of tank building experience backs the San-I-Tank so play safe and work with a tank specialist.

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determined by the fruits, its condition, subsequent processing, and its final use. This work has been done mainly with apples, but our tests indicate the same relationships hold for bananas, peaches, apricots, potatoes, and other related foods.


**Summary**

The stability of certain antioxidants, such as l-ascorbic acid, can be materially improved by the addition of an acid such as citric acid. The reasons for the great increase in stability are twofold:

1. This method completely inactivates the enzymes which, under normal application methods, are mainly responsible for the destruction of ascorbic acid.
2. The retention of the ascorbic acid is further increased as it has a greater stability under the slightly more acid conditions employed by this method.

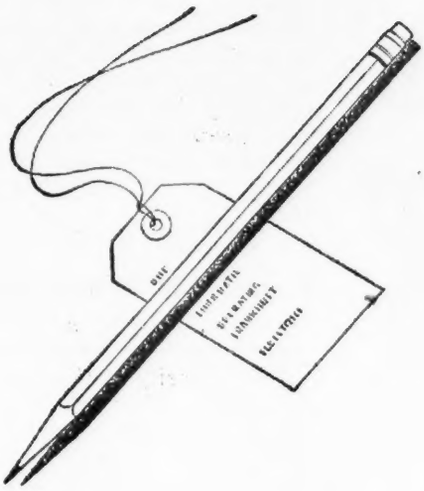
Combined use of citric and ascorbic acids produce such improved antioxidant properties over ascorbic acid alone that its use is broadened and its present applications improved.

The ascorbic-citric combination should find wide application in frozen food processing where ascorbic acid alone gives only limited protection or is too expensive for general use. Smaller quantities of this antioxidant may be used, thereby reducing the cost to a point where its large-scale commercial use is possible, instead of being restricted by price consideration to retail trade packages.

This mixture has been shown to be very practical as a means of preventing the discoloration of cut fruits and salads and should be of interest in restaurant and home use. A mixture of citric acid, ascorbic acid and sugar, when sprinkled over sliced apples, bananas, apricots, peaches, will hold the color and flavor of these extremely perishable fruits for many hours. This treatment also shows possible application in the drying of fruits, where color and flavor can be retained.

Data are presented on application methods. In the case of dipping methods, relationships between dipping times, concentration of dipping bath and citric acid adsorbed are presented. From this information it is possible to determine what strength bath and dipping time to employ for whatever acidity desired, as well as the composition and quantity of make-up solution.

The destruction of ascorbic acid in solution, due to atmospheric oxidation, can also be materially re-



# *Check list* for Peacetime Operation

Equipment has suffered during the war. Your compressor, for example, may have had to run extra long hours without adequate attention and may need to be replaced to assure dependability and low operating costs.

The Gardner-Denver "WB" Vertical Water-cooled Compressor provides a dependable, low-cost source of air power. Its rugged construction and advanced design have established long records of economical service. Cylinders and compression heads are completely water-jacketed to assure continuous operation. Compact, the "WB" takes but little space and requires no outside piping—installation is simple.

Check your compressor—it may need replacement. Replace with Gardner-Denver and be assured of dependable, low-cost service. For complete information, write the Gardner-Denver Company, Quincy, Illinois.

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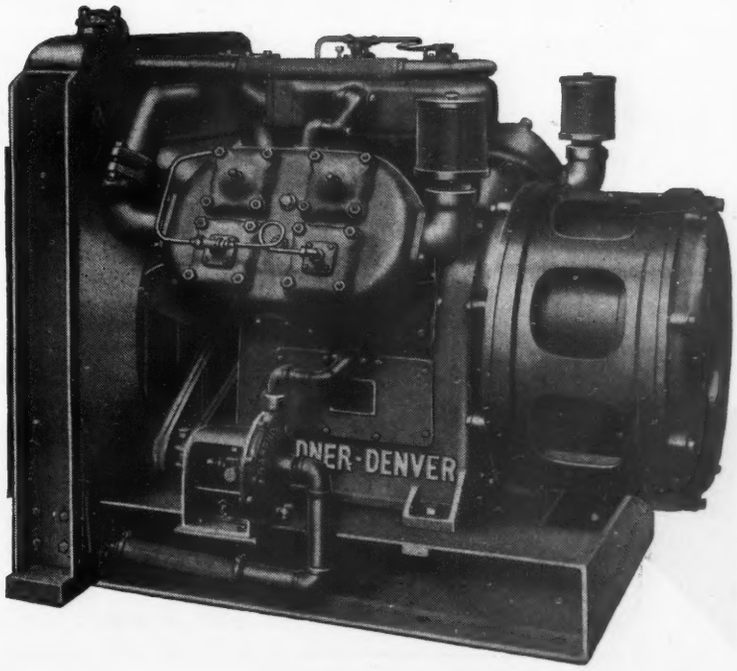
***Since 1859***

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- We mix or otherwise process, pack for consumption and ship as high as 20,000 lbs. per day for firms like yours.
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duced by the addition of citric acid to both sugar sirups and water solutions that may be used as a means of applying the antioxidant to the fruit. This addition of citric acid affords a means of reducing losses of ascorbic acid during the handling of these solutions. In cases where ascorbic acid solutions are not stabilized by the addition of citric acid, the presence of a high concentration of sugar exerts a similar protective action against atmospheric oxidation.

*—End—*

## Frozen Foods Marketing

(*Continued from page* 111)

The majority of these 6,500 locker plants are either selling commercial frozen foods and home storage cabinets or are considering their sale. The home cabinet is not, as many locker operators fear, a competitor, but the logical answer to the problem of having to make too frequent visits to the locker plant. Commercial frozen foods—if the quality is comparable with the home-prepared, locker-frozen product—should be able to follow the history of the ever increasing use of canned food in rural as well as urban areas before the war induced shortages and the revival of home canning.

Adding up these developments, it appears that our energetic manufacturers are about to remove the home storage bottleneck. From this point on distribution becomes simply the old question of stocking the pantry shelves with conveniently packaged, non-perishable food. Quality and price, in partnership with convenient delivery methods, will govern the quantities purchased and decide the ratio between frozen, canned, and fresh foods purchased by the housewife. Perhaps we should go a step further and say between cooked and uncooked foods.

### Precooked Frozen Foods

Frozen precooked food is a "natural" from the sales standpoint—provided the processors can deliver quality along with convenience. Not only the precooked meals on a "throw-away" plate, but the numerous individual packaged items arouse spontaneous and enthusiastic acclamation from the maidless housewife, the small family, the business woman in her efficiency apartment, and even the farmer's wife on the alert for relief from her confining three square meals a day.

The advantages of prepared, well-cooked foods to the lunch counter and small restaurant are obvious. To

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the chain restaurants, precooked food offers vital assistance in keeping up standardized high quality meals in their geographically scattered dining rooms. The Howard Johnson management has been reported to be so well satisfied with experiments they have carried on that they are planning to extend their chain of restaurants in the Southeast, at the same time establishing a food preparation and freezing center from which these restaurants can be supplied by refrigerated trucks.

Accounts of experimental and commercial operations in providing whole precooked meals or parts of meals, especially pies, are appearing in every trade paper as well as in the popular press. It has been stated that from 20 to 25 packers are now putting out over 40 items of precooked food. Pie bakers say that if they can deliver their pies frozen, it will enable them to put out, for the first time, a high grade pie with a tender, flaky crust, the type of pie they cannot handle under present delivery methods. Along the same line, the cake bakers point out, that the delivery of frozen cake would cut out the stale problem, which would probably pay for any extra expense incurred in freezing and delivering the cakes. Frozen doughs have proven successful in experimental trials and would be a substantial advance in convenience over the present popular mixes.

### Packaged Frozen Meats

Interest is mounting in the use of packaged frozen meats. Violent opposition may be expected to such a radical change in meat handling. Apart from the economical advantages of cutting and packaging meats in large quantities where the wastage can be made use of, the improvement in sanitary handling over present methods is important. All processing can be done either under federal inspection or, in the case of the small local packer, in state inspected and approved surroundings. The days of dirty, handled, sawdust-seasoned meats are about over when the housewife realizes the contrast with her clean, properly aged and cut, neatly packaged frozen meat.

Substantial progress has been made in converting poultry and seafood distribution from bulk packaged or non-packaged above freezing methods, to individually packaged, hard frozen zero transportation and storage.

The storage warehouse bottleneck has been at least partially broken by expansion during the war. The percentage of occupancy is now down. Of course, some of these war expansion facilities may not be ideally located for retail distribution of frozen foods.

### Future Outlets

According to surveys which have been made, 97 percent of all new supermarkets will carry frozen foods. Chain store operators are reported to be planning to sell frozen food in both new and old stores as soon as equipment becomes available and storage and delivery problems are worked out. Independent grocers and small chains will have to meet this competition, and the opinion frequently expressed that practically all grocers will sell frozen food seems a logical conclusion.

### Department Stores

Among the callers at my office was a young woman representing one of the leading department stores in a large southeastern city. This store has packaged food and electric appliance departments. The addition of packaged frozen foods and home storage cabinets to these two departments seemed an obvious expansion, and she had been sent out on an investigation trip.

The luxury food counters in department stores have long been indicative of their desire to get a larger proportion of the household dollar. At present they are getting only about one out of every four. They believe their credit and delivery setups, their know-how in merchandising to women and to the home, should enable them to enlarge their field. They have been handicapped in taking on food distribution by their location in high rental districts, entailing restricted floor space and lack of parking facilities. Food business in the past has been bulky, taking up a lot of space per dollar of sales. Frozen foods condenses all this into neat packages, avoiding all unsightly and unsanitary waste and accessories.

Indicative of the seriousness with which the department stores are taking this subject is the interesting research work that a group of outstanding stores, located from coast to coast, are carrying on through the Frozen Food Foundation in Syracuse, N. Y. It has been reported that some fifty stores are contributing to this work.

A companion research project in Syracuse is carrying on practical experiments along the line of making

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Multi-Pitch Flex-Grid Belt is specially designed for efficient turntable operations. Sprockets permit positive drive, free from slippage and stretch.
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One of Cyclone's three types of metal conveyor belts (Flex-Grid, Chain Link, Flat Wire) is well suited to do an efficient job in your plant. Flex-Grid (shown above) is ideal for the continuous processing of baked goods and of such frozen foods as apples, peaches and apricots. It can be readily cleaned and is extremely flexible. Cyclone's 25 years' experience in making metal conveyor belts for industry is your guarantee of long-lasting, dependable service. Offices in principal cities . . . factories in Middle West and on Pacific Coast. Write for free catalog No. 3.
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In 1945 insects and rodents cost food men over a billion dollars! What was your share? Enough to want to cut . . . which unquestionably Westvaco Methyl Bromide will!

It has demonstrated it gets a complete kill of *all* profit-devouring pests—even in the inaccessible spots where ordinary fumigants fail. Conclusive tests prove Methyl Bromide ventilates so rapidly that only a short shut-down is necessary. Thus Westvaco Methyl Bromide saves valuable time and money!

Other reasons why leading fumigators prefer Methyl Bromide include its harmlessness to food products, its ease of application, its effectiveness at low temperature and its adaptability to every type of fumigation.

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An important supplier of Methyl Bromide, Westvaco offers a constructive, on-the-job technical service in its application. Without cost or obligation, we will be pleased to furnish technical data and to recommend competent nearby industrial fumigators expert in the use of Westvaco Methyl Bromide.

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weekly deliveries of frozen food stocks to the home, where it is held in 3- or 4-cu. ft. freezer-storage cabinets. They plainly have an interest in a complete line of high quality foods which include fruits, vegetables, poultry, seafoods, meats, ice cream, pies, cake doughs and other bakery products, as well as complete pre-cooked meals on a "throw-away" plate. Of course, all of these items are not now available, but even with the present limited supplies, the results have been encouraging with respect to keeping down delivery costs and keeping up weekly sales volume.

### Frozen Food Stores

Another interesting development is the appearance of special frozen food stores, both independent and chain. Some of them are planning to sell home storage cabinets in combination with frozen food, with regular deliveries to the home a natural corollary. In illustrations of established stores and plans for future stores, the stocks are held in floor cabinets along the walls, the space above being used for more or less elaborate and attractive decorations. Will this unused wall space be a temptation to put up shelves and turn the project into a general food store or possibly to put tables in the center of the room, an oven for heating and a serving counter in the back, to serve frozen precooked foods in competition with both drug store counter and smart tearoom? The possibilities of enlarging operations without materially increasing overhead will be greatly increased when a wide range of precooked frozen foods are available.

It would be a mistake, however, to take it for granted that the experimental work on precooked foods has been completed. Many of the products are still laboratory experiments and not all quality problems have been solved. Converting comparatively small commercial operations to mass production, and at the same time retaining quality and reducing costs to a competitive basis with other food forms, involves other problems to be worked out. To a large extent this warning should be applied to all frozen food work.

Although the food industry is the largest in the country and food processing is its most important and most rapidly growing branch, I have no answer for the question: "Where can I get my technical training?" It is true that attempts have been made to install training courses, but few, if any, of these appear to meet the needs of the frozen food industry. A

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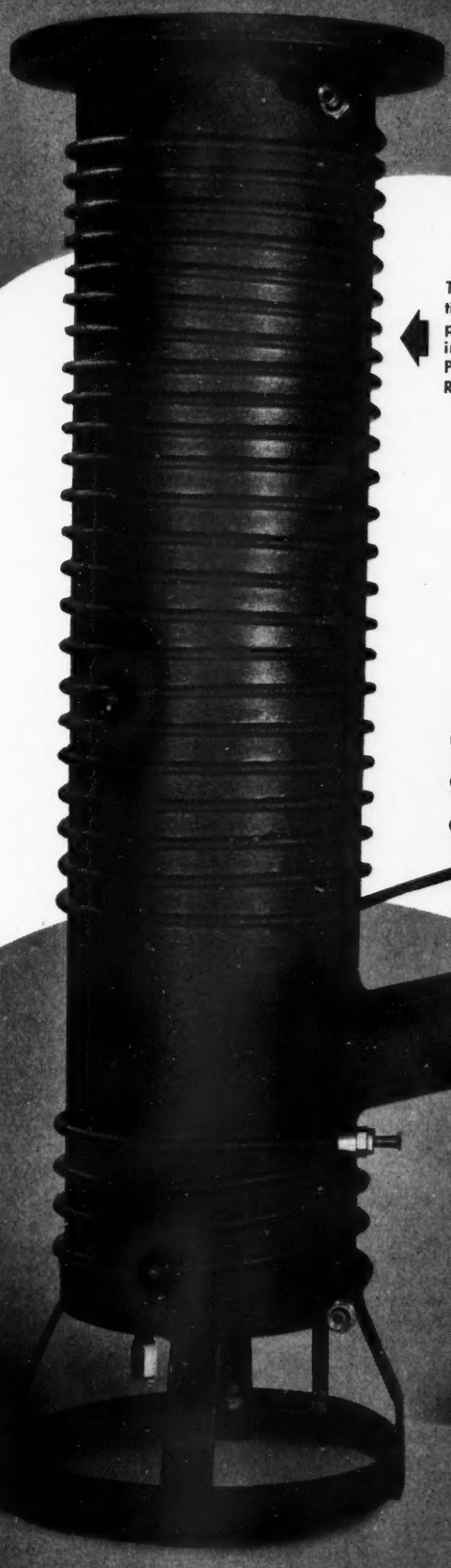

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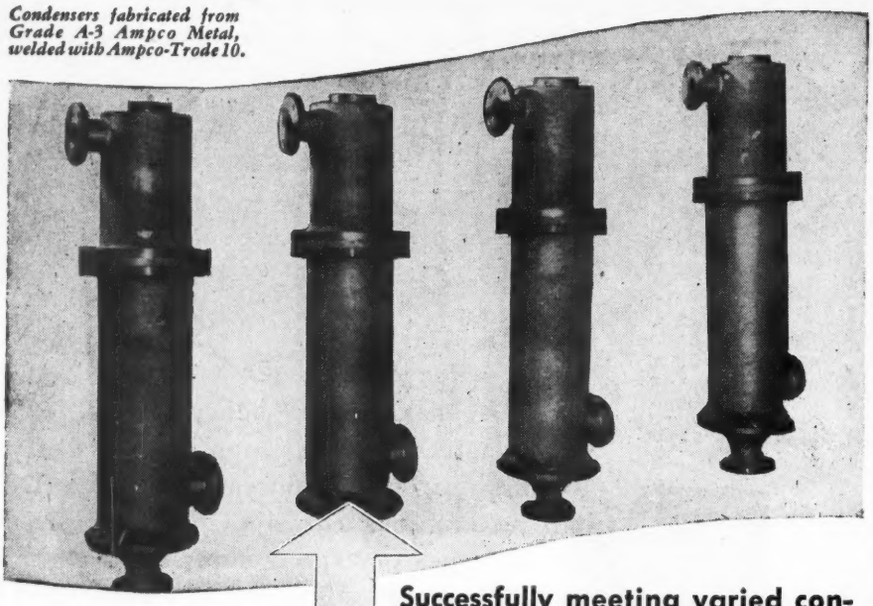
*Condensers fabricated from Grade A-3 Ampco Metal, welded with Ampco-Trode 10.*



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**Ampco Metal gives you these advantages:**

1. Exceptional resistance to corrosion, erosion, abrasion, and cavitation in the routing of liquids, semi-fluids, and liquids containing solids in suspension—such as acids, petroleum sludge, alkaline solutions, sea water, mine waters, food-product liquors, hot brine, etc.

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**Ampco-Trode deposits weld metal comparable in strength, ductility, and hardness with the five grades of Ampco Metal.**

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wide variety of products are involved and most of the attempts at education are too specialized and scattered. The industry's demands have apparently outstepped the educational institution.

Another bottleneck to be taken into account when distribution demands increase is the securing of high quality agricultural raw material to support the food freezing plant. This is distinctly a problem for the agricultural extension horticulturist and the food processor's field man.

All signs point to the formation of ample distribution channels to the home for all the frozen food which can be produced in 1946; in fact, sources of supply will probably be the limiting factor. Once these channels are established and asking to be filled, the road will be cleared to meet the demand coming from the home. No food packer can turn his back on such a market.

*—End—*

## Corn Starch

(*Continued from page* 102)

of the middle and late 1700's refers to other functions of starch in textile sizing, in foundry molds, in paper making and in adhesives. Although in those early years, very little mention is made of its use as a food product, it can probably be assumed that the housewife of that time had discovered ways to use it as food and in the preparation of food.

The first factory in the United States was established by John Biddis at Hillsborough, New Hampshire, in the year 1802. This was a potato starch factory and it was not until the year 1841 that United States Patent No. 2,000 was taken out by Orlando Jones on corn starch manufacture. Using this patent for separation, Colgate & Co. built corn starch factories in 1844 at Jersey City, N. J. and Columbus, Ohio. These two factories mark the beginning of the corn starch manufacturing industry in the United States.

There are now about nine major companies that constitute the so-called corn wet-milling industry, producing by far the greater quantity of starch for domestic consumption. These factories run continuously, in contrast to the 24 mills in Maine and one in Minnesota that manufacture potato starch from cull potatoes on a seasonal basis. One relatively small concern manufactures rice starch and there are also several companies that mill wheat starch. But from the

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| | Flies, ants, gnats, mosquitoes, fleas, ticks, wasps, cockroaches, carpet beetles, moths, silverfish, bedbugs, weevils, cadelle, and other stored product insects. | | | | |
| YOUR PLACE OF USE | UNDER THESE CONDITIONS | | | | |
| | On surfaces where *wetting* by water and *visible residue* are not objectionable. | On surfaces where *wetting* by water is not objectionable and *visible residue* is not desired. | On surfaces where *wetting* by water *is* objectionable and *visible residue* is not desired. | For large users who may wish to prepare their own spray mixtures by adding solvents. | On floors and baseboards, in cracks and crevices of woodwork, dark places behind pipes and other places insects infest. |
| | — USE — | — USE — | — USE — | — USE — | — USE — |
| YOUR PRODUCT | **DEENOL 50-F** Wettable powder; mix with water, use as spray. DDT—50%. | **DEENOL 25-EM** Emulsifiable oil; dilute with water, use as spray. DDT—25%. | **DEENOL 5-H** Ready-to-use oil spray. DDT—5%. | **DEENOL 25-C** Concentrated oil; dilute with a solvent, use as spray. DDT—25%. | **DEENOL 10-A** Ready-to-use dusting powder. DDT—10%. |

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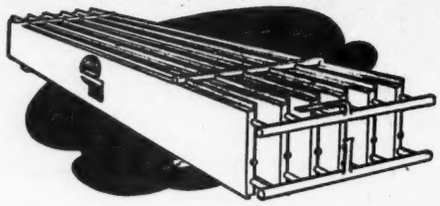

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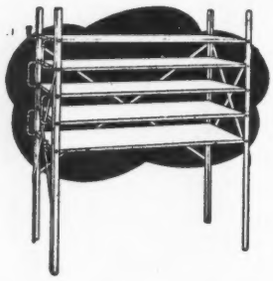

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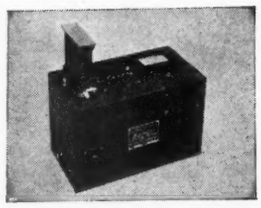

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standpoint of volume of production, the corn wet-milling industry dwarfs any other source for starch.

Next to corn, the major sources for starch are found in imported tapioca, sago and arrowroot, most of which come from the Netherlands Indies.

Production figures for the year 1942 show a production of 4,440,000,000 lb. of corn starch, of which 2,900,000,000 lb. went into refinery products and 1,540,000,000 lb. represent the total starch and dextrin production. Of this latter, about one-third was consumed for food uses and the remainder for industrial purposes.

In a forthcoming issue will be presented a table of the non-food uses of starch.—Ed.

*—End—*

## Hydrolysates

(*Continued from page* 98)

in solids content in hydrolysates of certain kinds of proteins. Hydrolysates from corn, for example, show a considerable difference in amino nitrogen content from soya meal hydrolysates. The difference in flavor is also considerable. Analyses of various commercial hydrolysate pastes show wide variations in salt content. These variations in salt content show there is a need for technical control in the making of the pastes. An objection to pastes is that a partial destruction of some of the flavorful amino acids results during concentration of the liquid hydrolysate, even when done under vacuum.

### Amino Nitrogen Important

Indications are that the higher the amino nitrogen content of the hydrolysate, the better the taste. This conclusion is reached as a result of an analysis of commercial hydrolysate powders. One sample contained 25 percent starch, a low salt percentage, and a high amino nitrogen content. Another sample had a fairly high amino nitrogen as well as a fairly high salt content. Still another sample had a low salt and a high amino nitrogen content. In every comparison, the samples with high amino nitrogen content rated higher in flavor quality than other comparable samples with lower amino nitrogen content. In a typical protein hydrolysate made by HCl hydrolysis and having a good flavor quality, the amino nitrogen content is high. Also all essential amino acids, excepting tryptophane, are present in desirable quantities. The conclusion is that when a hydrolysate powder is of such composition, it will

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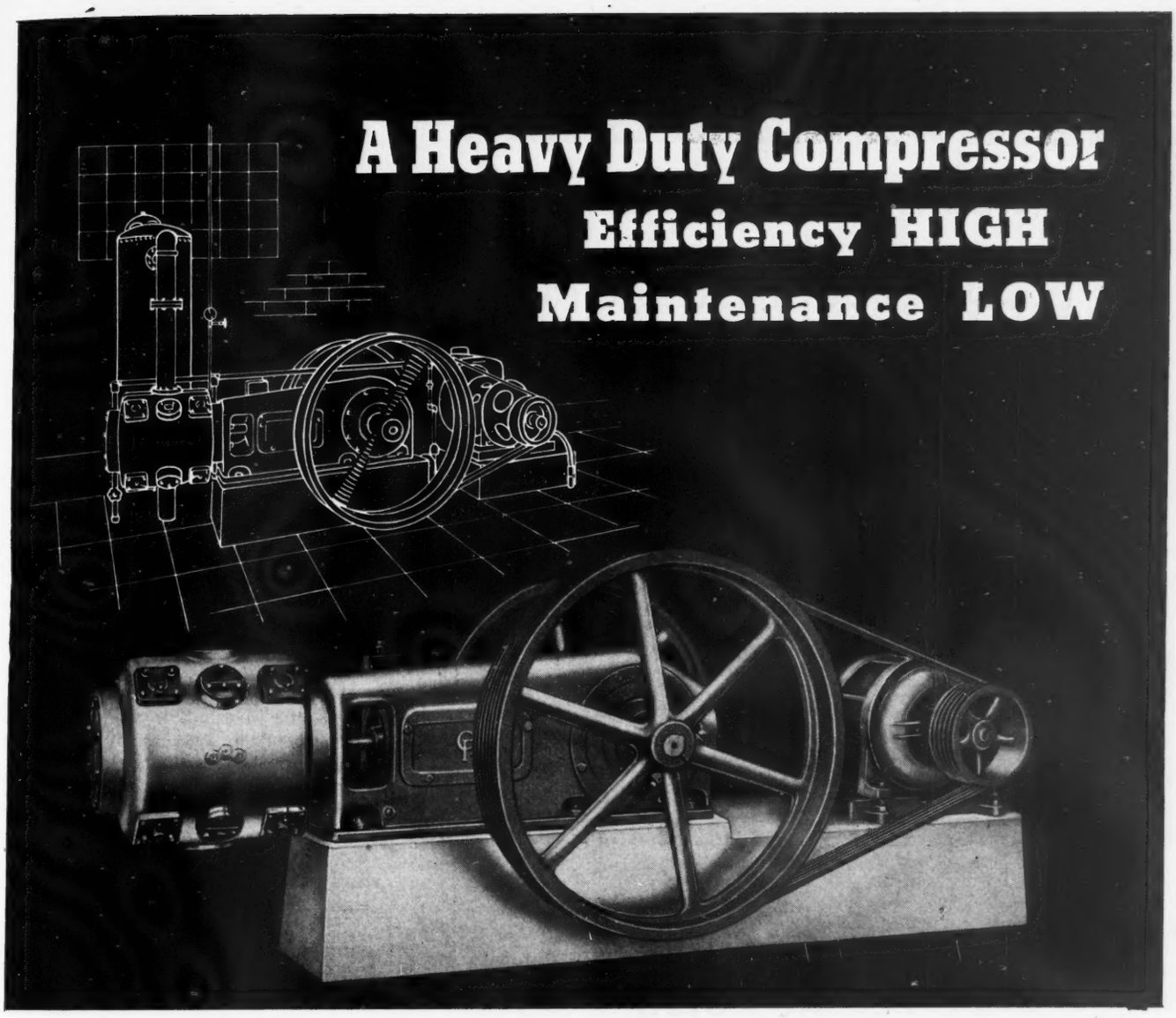

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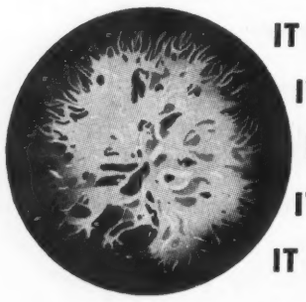

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possess fairly good flavor and also will have fairly high nutritional value.

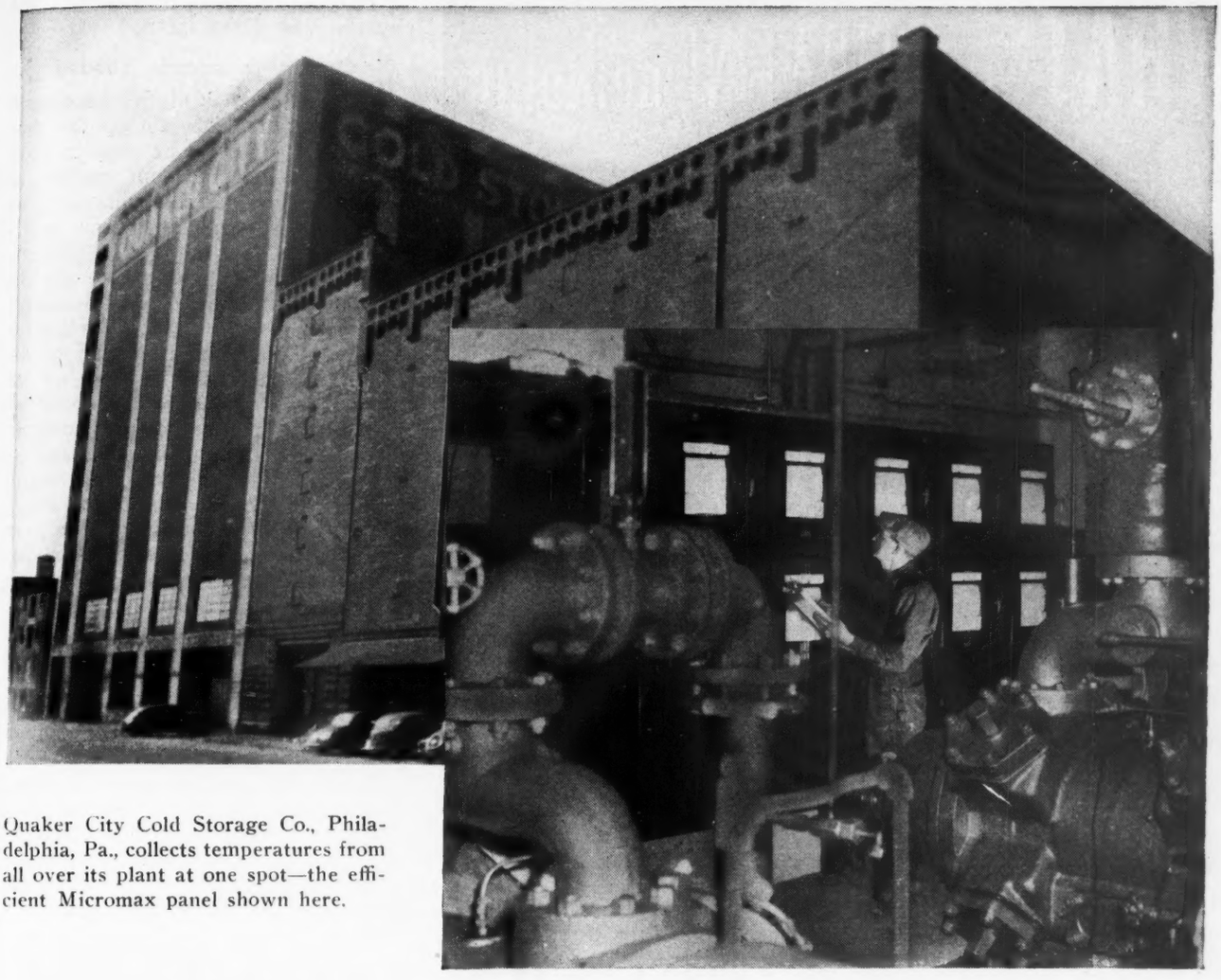
Effect of high pressure on protein hydrolysis has been the subject of a series of experiments at Northwestern University under a research grant. The object of these experiments was to determine whether commercially practical hydrolysis could be obtained with pressure without the use of acid or alkali or, at least, with a greatly reduced percentage of acid or alkali.

### High Pressure Tests

. When water alone was used at 190 deg. C. and 290-lb. pressure, only 8.65 percent hydrolysis resulted, with the formation of a large quantity of humin. Even at 1,000-lb. pressure and high temperature, a commercial degree of hydrolysis was not obtained. Use of 0.5 percent HCl and application of 200-lb. pressure at 210 deg. C. gave 22 percent hydrolysis. Additions of 1, 2, 5, and 8 percent HCl with varying pressures gave only slightly better results. Additions of alkali in the same percentage order as that of acid used and under similar processing conditions gave no more than about 27 percent hydrolysis. With 10 percent acid at 100-lb. pressure (158 deg. C.) for 7½ hours, 74 percent hydrolysis was obtained. Evidence that time of processing is not an essential factor is shown by the 74 percent hydrolysis obtained by bringing the mixture up to 100 lb. over a 3-hour period.

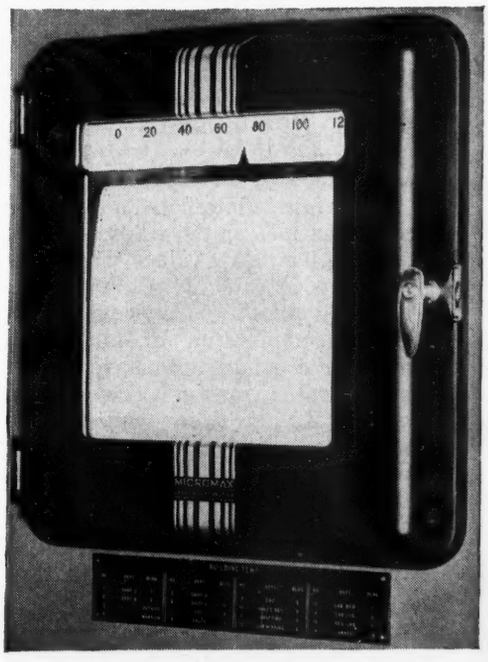
Analyses of the hydrolysates obtained with varying percentages of acid under pressure showed liberation of a large quantity of ammonia. Presence of ammonia indicates destruction of some of the amino acids. Under these conditions of processing the percent of hydrolysis was measured by boiling off the free ammonia and determining the amino-acid content of the remaining material by the Van Slyke method. The Biuret test is not used because some proteins give a positive Biuret test.

Results of these tests indicate the extent to which high pressures can be used. They also indicate the need for a definite percentage of HCl to combine with the amino acids to form the hydrochlorides. At least 18 percent HCl must be present to form the hydrochlorides of the liberated amino acids. In addition, a small excess of HCl is necessary. Most of the commercial hydrolysis has been done with approximately 25 percent HCl. We have found that 18 to 20 percent HCl with 10-lb. pressure at 113 deg. C. will give complete



Quaker City Cold Storage Co., Philadelphia, Pa., collects temperatures from all over its plant at one spot—the efficient Micromax panel shown here.

# Big Building Saves Big Sums with Micromax Temperature Recorders

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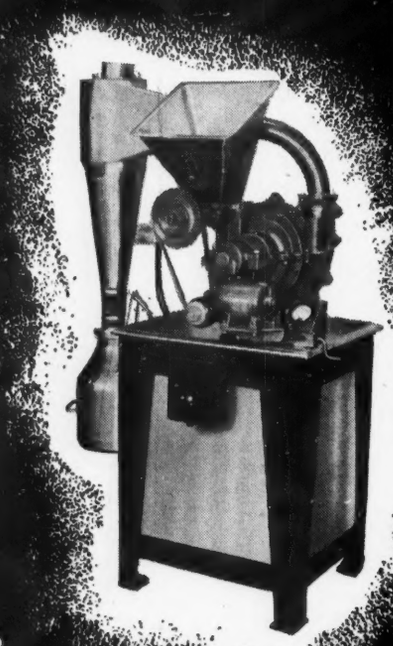

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hydrolysis in 5 hours, as determined by the Van Slyke method.

### Quality Standards Needed

We believe that higher standards of quality should be set up for protein hydrolysates to be used in food products. Under present marketing conditions, the amino-acids content is seldom known. The same criticism holds for their salt content. Setting up of reasonable quality standards would help food processors and packers to obtain hydrolysates of desired flavor and keeping qualities. Obviously the setting up of standards of quality is dependent upon acceptable methods of analysis or determination. Thus far many of the methods for determining amino acids are open to question. Much work has been done during the past two years on microbiological methods for determining individual amino acids. In a recent issue of the *Journal of Biological Chemistry*, Merck & Co. Research Laboratories describe a new method for determining the ten essential amino acids. The method is identified as being a quick one and one which can be used with a high degree of accuracy in small laboratories. Chemical methods now in use are accurate only to about 10 percent. Even that degree of accuracy calls for considerable chemical skill.

### Taste and Flavor Factors

This new method of determination of amino acids is of particular interest in the evaluation of protein hydrolysates, aside from its accuracy and convenience, because the identity of the amino acids is as essential as the amount of amino acids present. The "non-essential" amino acids, in most instances, contribute a better flavor to the hydrolysates than do some of the "essential" acids. Mono-sodium glutamate and other "non-essential" amino acids, such as glycine, give flavor values which impart a good taste to food products. For this reason, hydrolysates which have a combination of all amino acids are considered to have a preferred quality rating. They give a more satisfying flavor and a more acceptable taste value than when only one of the amino acids is present. One exception is when protein hydrolysates are used in chicken soups.

Protein hydrolysates offer a challenge to food chemists to find specific uses for them in foods. In many cases, they enhance the flavor of many foods, but there has been considerable prejudice against their use. One of the prejudices is based on the

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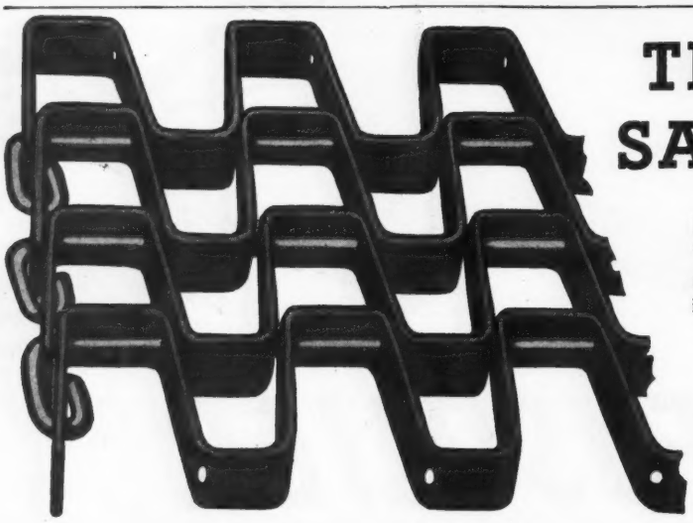

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hygroscopicity of the powders. That prejudice can be overcome through the use of liquid hydrolysates, except when the product in which they are to be used is in dry flake, granular or powder form.

Among the foods in which hydrolysates can be used are soups, stews, broths and bouillons. One product in which they cannot be used satisfactorily is chicken soup, because of the apparent reaction that occurs between some of the amino acids and dextrose, which is the sugar usually in dehydrated soups. A very definite darkening of color occurs when dextrose is used. There is probably an aldehyde reaction, although this has not been definitely established. In order to flavor dehydrated soups containing dextrose with a hydrolysate, it has been found necessary to use sodium glutamate, which does not give any color reaction with reducing sugars.

### Heavy Investment

Much research work will be done in the future on protein hydrolysates and their uses. There is already a heavy investment in expensive development work and production facilities. This investment will increase, owing to the interest of the medical profession in certain types of protein materials. Attention here centers on sulphuric acid hydrolyzed protein, because here we do not have the disadvantage of having salt in the final product, which cannot be tolerated in quantity in medical products. The method used with sulphuric acid is similar to that with hydrochloric acid, save for the problem of neutralizing the sulphate ion. It is difficult to get rid of all of the calcium sulphate when lime is used for the neutralization, owing to the high water solubility. Another phase of the problem is the elimination of pyrogens, and sterilization of the product, if for parenteral use.

Much of the needed research work on protein hydrolysates should be for the production of a type of product which can be used satisfactorily in both the food processing and medicinal fields. Protein hydrolysis can be regarded as still in its infancy. There is the possibility that eventually most of the amino acids may be synthesized on a commercial scale. A few are being synthesized at the present time. They are potentially usable in medicine and for foods. Cost of production for tryptophane was $280 per pound about a year ago. Now, that cost is reduced to less than $150 per pound. This marked reduction in cost of production in one year indicates that tech-

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nological as well as scientific progress is being made in amino acid synthesis.

Commercial protein hydrolysates are fairly good products today, considering the limited amount of investigation that has been done so far. With the expanded research now under way, more flavorful products are justifiably anticipated for increasing use in a greater variety of foods.

## Nitrous Oxide Freezing

(*Continued from page* 83)

influenced the result, and no evidence could be found in support of such a view.

**Vegetables**—In Germany blanching is regarded as essential only when there may be a delay of one or two days in consuming the vegetables after removal from freezer storage. "Wirsing," a white cabbage variety, is not blanched, but merely shredded. After a year in freezer storage at –18 deg. C., the white mid-ribs and many of the leaves were a bright red, presumably due to enzymatic oxidation. Carrots were frozen whole, or, if exceptionally large, were split longitudinally prior to freezing. The outer layers of such carrots had bleached noticeably, the greatest depth of color being in the flesh adjacent to the core. This region sometimes appeared to be the only part of the carrot with any color. Spinach was blanched for two minutes in boiling water.

**Fruits**—Of the fruits, only plums were available for inspection. Since fruits are customarily not blanched before freezing, these were probably the only commodity observed that approximate the standards of quality found in the United States, except for the adhering dirt, which would not be tolerated by us.

It should be re-emphasized that the poor quality of the vegetables is of minor consideration because prompt and proper handling would readily eliminate these criticisms.

### Freezer Storage

The frozen food is stored in two insulated rooms, 15x10x3 m., at –18 deg. C., refrigerated by ammonia. The rooms adjoin each other with a small common antechamber. The stored frozen food was utilized in the company restaurants by the employees. Strawberries and other small fruits had been frozen, and there is no reason to doubt the statement that they were popular items on the menu.

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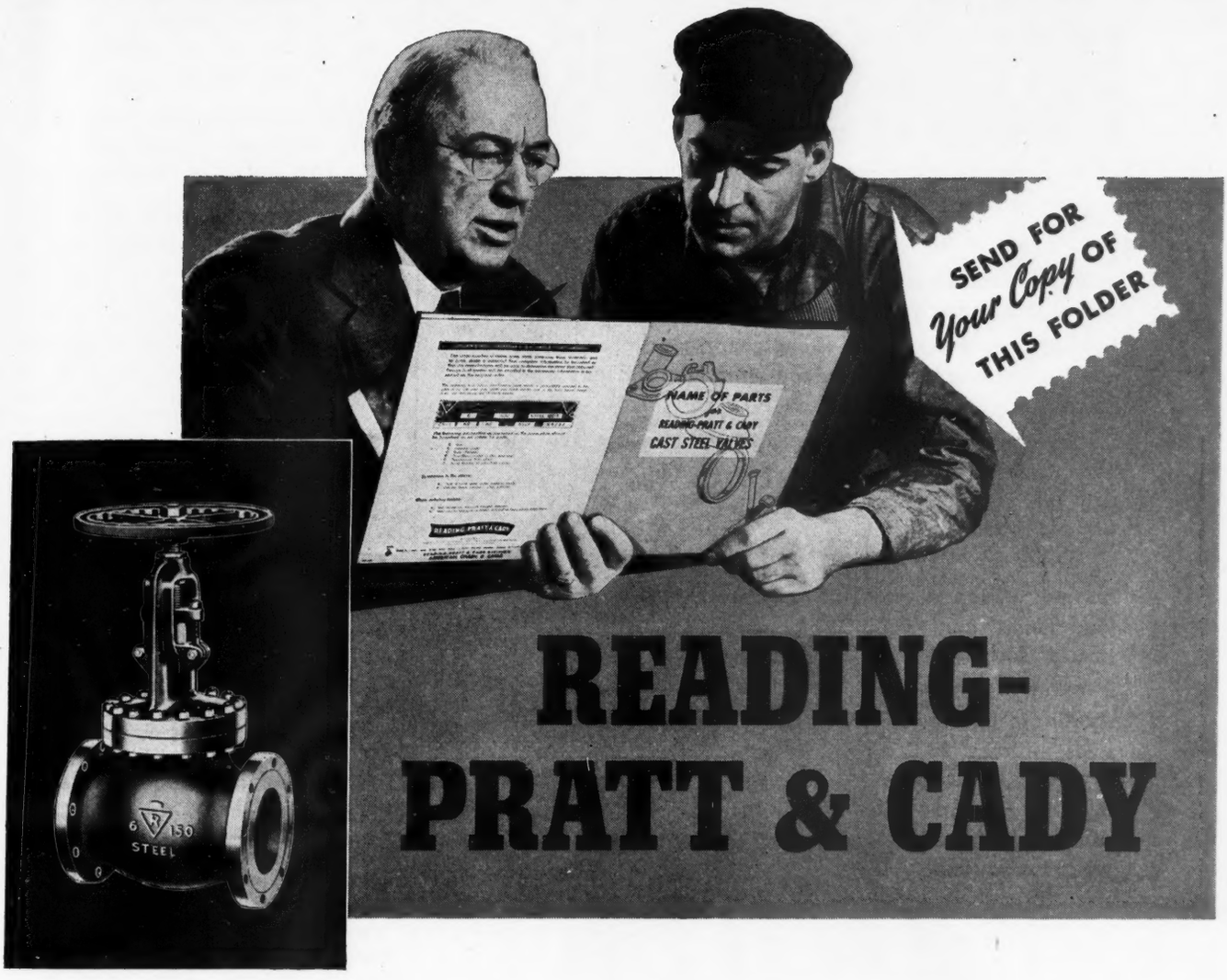


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**Data on Liquid $N_2O$ Supplied by Plant Officials**

Specific gravity of liquid at —90 deg. C. .....about 0.90 to 0.91
Specified heat of liquid.....
.....about 0.30 calorie per gram
Latent heat.....about 80 calories per gram

### Comments on Method

Immersion of the food to be frozen in the primary refrigerant has distinct novelty and advantages. The method may be analyzed in two phases:

1. The merits and demerits of the system $N_2O$ gas—$N_2O$ liquid.
2. The choice of another liquid-gas system.

It should be obvious from the start that the use of nitrous oxide by I. G. Farbenindustrie is fortuitous. The extension of its use at Höchst to other plants depends upon a proper analysis of costs. In view of the small loss of $N_2O$ from the circulating system, the cost of nitrous oxide used by an independent concern would be a capital item rather than an operating cost. The economics of the operation consequently hinges on the cost of converting $N_2O$ gas from one atmosphere pressure and ambient gasometer temperature to liquid at the same pressure and –90 deg. C. temperature. Regardless of how the $N_2O$ is procured, the user will still need his own gasometer, compressor, cooling system and storage tanks. He will need a compressor of the capacity described here if he is to freeze a ton of food per hour, as the following calculations show. They are approximate, based on certain simple assumptions.

It is *assumed* that the processor desires to freeze 900 kg. of food per hour, of which possibly 800 kg. are water. The dry matter, which has a low specific heat compared to water, can be ignored. Also, there is no need to bring the center of the package to –38 deg. C., and we assume –20 deg. C. to be adequate, with possibly an average of –40 deg. C. for the package as a whole.

a. Heat to be removed from the food. This may be computed stepwise as follows: The kilocalories involved are:

800 ×20 (water 20 deg. C. to 0 deg. C.) + 800 × 80 (latent heat) + 800 × 0.50 × 40 (ice 0 deg. C. to — 40 deg. C.) = 96,000 kilocalories.

b. Heat absorbed by one kilogram of $N_2O$. A similar computation gives:

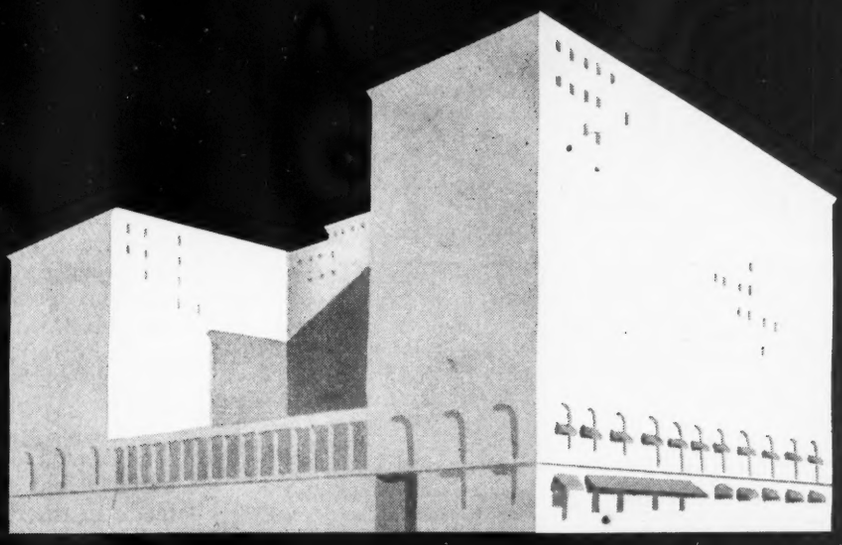
50 × 0.3 ($N_2O$ liquid from — 90 deg. to — 40 deg. C.) + 80 (latent heat) = 95 kilocalories.

c. Number of kg. of $N_2O$ required.

Since 96,000 kilocalories are removed from the food and 95 are absorbed by 1 kg. of nitrous oxide, 1,000 kg. $N_2O$ are evaporated per hour.

d. Volume of $N_2O$ to be compressed.

One kg of $N_2O$ occupies about 500 liters at one atmosphere so that 1,000



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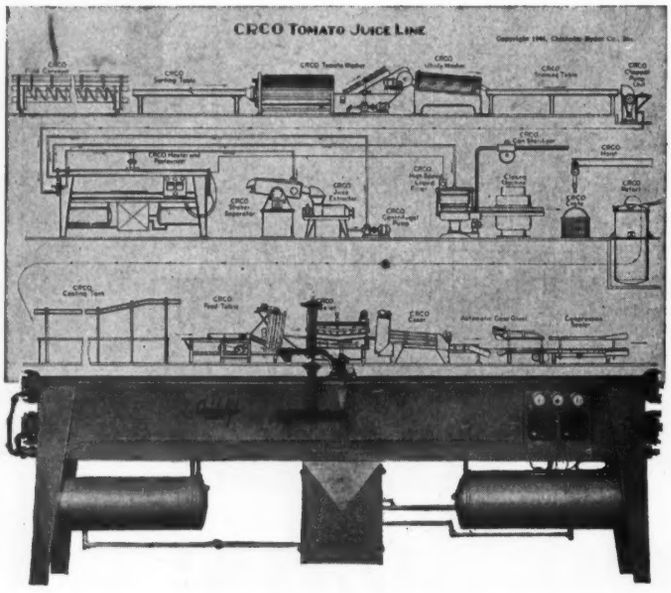


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kg. occupy about 500,000 liters or about 500 cubic meters.

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e. Balance.

With 24 hour compression, balance can be maintained by freezing for $24 \times 360 \div 500 = 17$ hours.

It is hardly necessary to point out here that a compressor would not be operated continuously. This calculation is merely to determine the orders of magnitude, and it is clear that a compressor of this capacity is needed to freeze 10 to 12 tons of food per day. No attempt has been made to introduce refinements into the calculation. Thus, the nitrous oxide at –40 deg. C. after vaporization is assumed to return directly to the gasometer, whereas in practice it is used to precool the ensuing charge.

Since no reduction in size of the compression units is possible, it is unlikely that any reduction would be made in the cooling units. Far less storage capacity than that shown on the attached diagrams would be involved, and operations could conceivably be conducted with less than seven or eight tons of nitrous oxide.

### Other Possible Refrigerants

Reverting now to the question of other liquid-gas systems, carbon dioxide is practical only under pressure. Its triple point (where gas, liquid and solid are in equilibrium) exists at –56 deg. C. at 5 atmospheres, while at one atmosphere the solid $CO_2$ is at –78.5 deg. C. Solidified $CO_2$ would be fatal to the fluidity of the system, and the difficulties in engineering would be great.

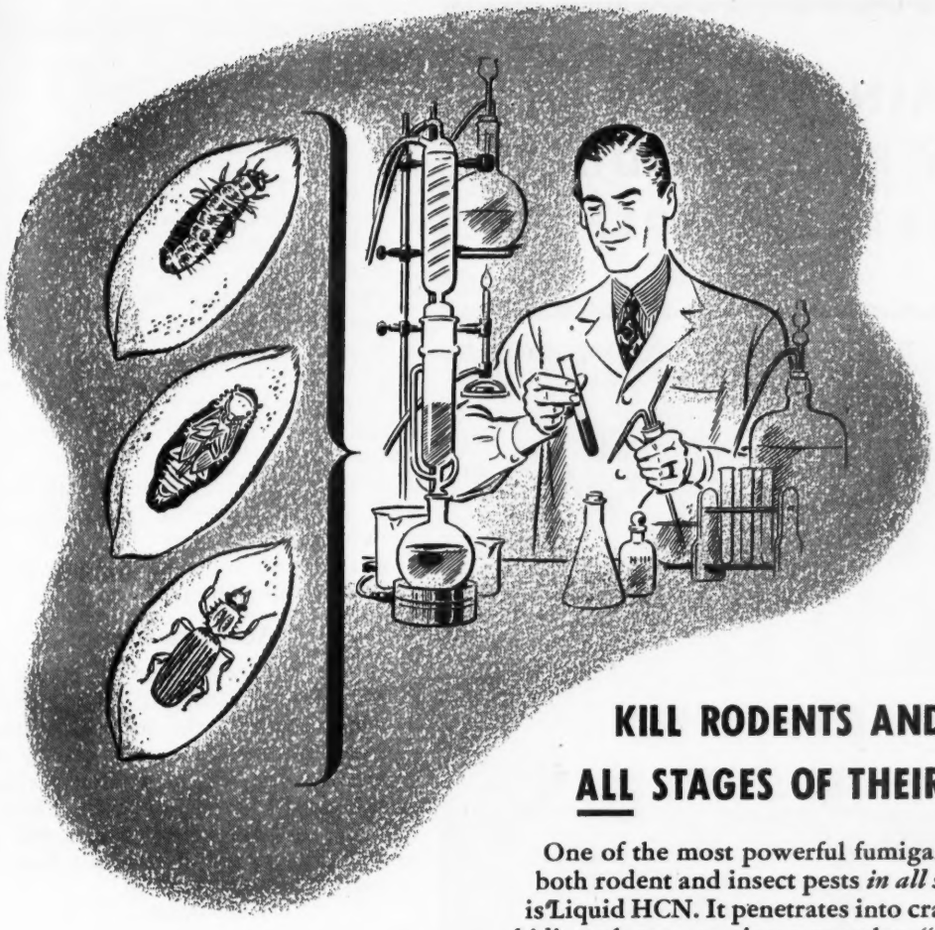
One stipulation that has not been sufficiently emphasized is that the gas chosen for immersion freezing must have no harmful effect, nor should it leave any residue in the food. Whether the Freons would be permissible need not be discussed here. Nitrous oxide has a higher latent heat than F-12, but since F-12 occupies less than half the volume per unit weight, under the same conditions of temperature and pressure, the size of the compression unit would not be greatly affected. The properties of a Freon, boiling at –30 or –40 deg. C. at one atmosphere, might be more nearly ideal.

The ideal gas would presumably have the following physical properties:

1. A high latent heat.
2. Boil in the range –40 to –80 deg. C.
3. Have a low specific volume.

In addition, it must be chemically inert.

One important point in favor of the nitrous oxide is that the com-



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# LIQUID HCN

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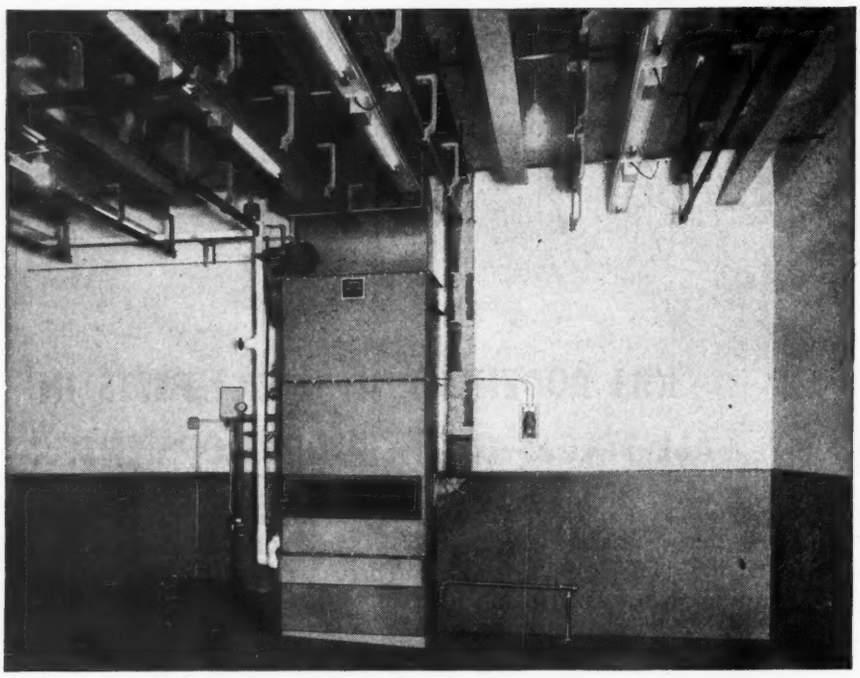

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pressed gas can be liquefied in a water condenser. No expensive refrigerant is needed, therefore, to remove its latent heat.

### Summary and Conclusion

I. G. Farbenindustrie has solved the engineering problems involved in quick freezing by immersion in liquid nitrous oxide. The capacity of their pilot plant is approximately one ton per hour. They envisaged the sale of their surplus nitrous oxide to processors of frozen foods in Germany, and there is every reason to believe that this would have been put into effect. The method should be carefully considered by U. S. processors of frozen foods, to determine whether the theoretical advantages are feasible and adaptable to their plants.


### Acknowledgment

The writer desires to thank Lt. Col. D. B. Dill, Q.M.C., through whose courtesy the desired personnel were interviewed. To clarify numerous details, the writer revisited the plant in company with a British team, and the report necessarily reflects, in part, a subsequent free discussion of the problem.


*—End—*

## IFT Meets

(*Continued from page* 80)

program based upon the use of direct microscopic examination of both raw and pasteurized milk. The inherent advantages of the test lay in the saving of time required, its reflection of plant-operating methods and practices, and significance as a plant control aid.

### Electronics Popular

Standing room only was the order through most of the electronics session, which opened with an excellent analysis of the use of electronics in regulating processes, by Dr. W. M. Urbain, Swift & Co. He described such uses as liquid level control, density of smoke in a smoke house, turbidity, color, and pH of a liquid, temperature and the like as capable of electronic control.

The basic theory and limitations of high frequency heating equipment were clearly explained by T. P. Kinn, Westinghouse Electric & Mfg. Co. High frequency heating falls under two general classifications—induction and dielectric. The former represents the heat generated electrically in a good conductor, whereas with the latter the heat is generated through a poor conductor. Offering

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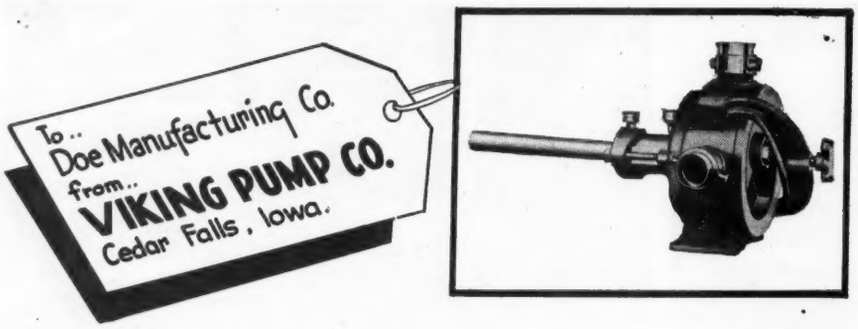


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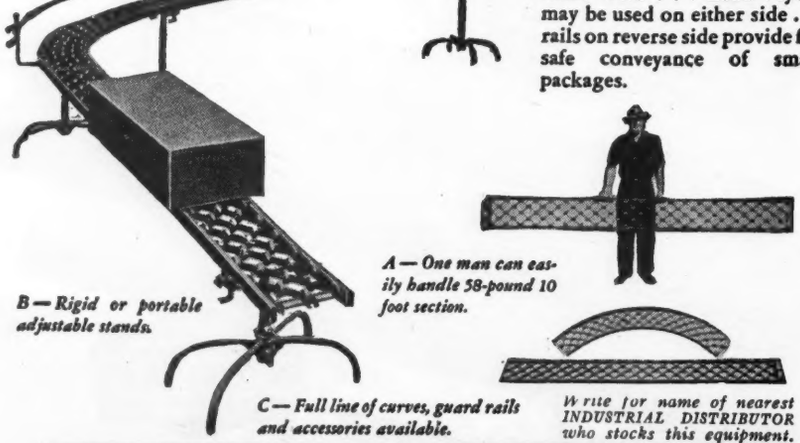

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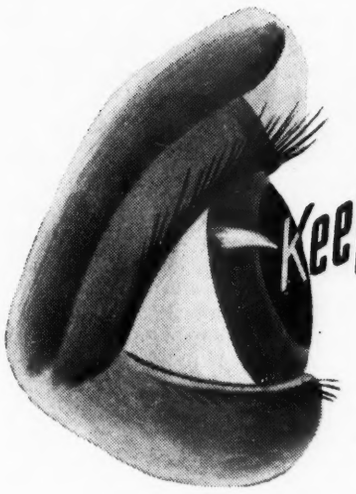
a few examples, he cited copper as having a resistivity, measured in ohms per cubic centimeter, of $1.7 \times 10^{-6}$; ham, 5; tap water, between 5- and 10,000; potatoes, 5,000; carrots, 11,000; bread, 30,000, and frozen peas, 50,000,000, depending on the state of rigidity. Depth penetration of the heat is great with low frequencies and rapidly reduces as the frequency rises. For instance, in a ham the depth penetration at 60 cycles would reach the absurd figure of 188 ft., whereas at $500 \times 10^{-6}$ cycle the penetration is only ¼ in. Efficient induction heating, he added, should have a penetration of less than one-third the thickness or diameter. Because it is so expensive, Mr. Kinn urged all food technologists to first study the economics of dielectric heating before starting any project. What is required in the way of heat and its application must be specified before the electronic engineer can provide the proper information.

### Other Uses

J. C. Moyer, New York State Agritural Experiment Station, reporting on blanching of vegetables by electronics, based his remarks on experiments that were inconclusive and that still have many problems to overcome. Dr. H. G. Beattie, Atlantic and Pacific Tea Co., told of the using of high frequency for defrosting frozen material and for treating bread. In frozen materials, such as eggs and frozen fruits, the defrosting time is so drastically reduced as to practically eliminate bacterial growth and flavor change. When packaged bread was passed through an electronic field and its temperature raised to 140 deg. F., no growth of any kind appeared within seven days.

Some of the Army's unsolved nutrition problems were uncovered by G. H. Berryman, Medical Nutritional Laboratory, U. S. Army, during the session on nutrition. He advocated further study of such unknowns as the production of vitamin B complex nutrients by intestinal synthesis. Carbohydrates may have a part in this synthesis, he said, or it may be that proteins in conjunction with carbohydrates play a part. Another job requiring research is to find a method of measuring calcium change in skeletons due to lack of calcium intake or assimilation.

Water intake during a hard march has a very definite effect on fatigue, declared R. E. Johnson, Harvard Fatigue Laboratory, in discussing the field evaluation of Army nutrition. Troops given two-thirds of a



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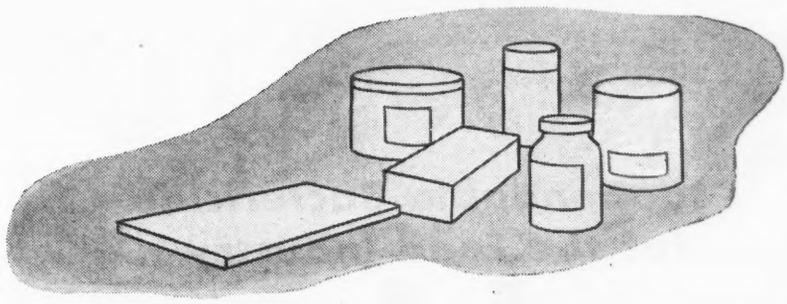

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quart of water per hour were able to march for long periods, while those denied water soon became fatigued and disorganized.

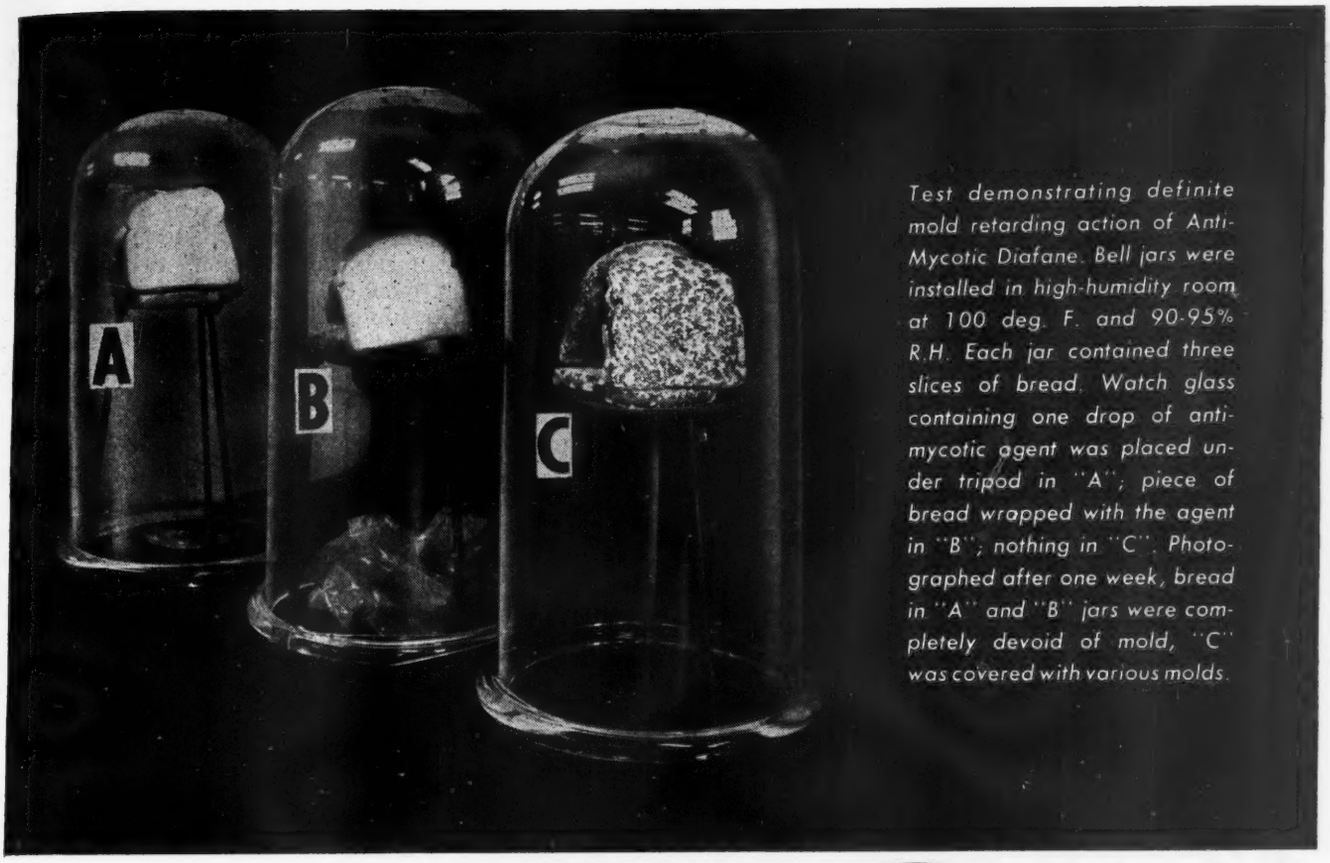
In discussing the effect of nutrition on food intake, S. Lepkovsky, University of California, emphasized the importance of acceptability. Unacceptability may be traced to various causes in the individual or to deleterious components in the food itself. Soybeans, for instance, contain such components, which accounts for their unacceptability. By autoclaving soybeans most of these compounds are either destroyed or changed, so that the product is rendered acceptable.

M. S. Dunn described various analytical methods for determining amino acids at this session, while J. McIntosh told of the effect of various cooking methods on the vitamin retention in vegetables, thiamin and ascorbic acid.

F. A. Lee, New York Agricultural Experiment Station, revealed that there was no substantial loss of either vitamin or carotene when raw carrots were blanched for three minutes in boiling water, then sliced and frozen. There was also practically no change in carotene content when the carrots were properly stored.

### Dehydration Studies

E. M. Mrak, University of California, reviewed recent developments in the dehydration of fruits to open the Wednesday morning session on dehydration. Correct harvesting, he said, is essential to the making of superior quality dehydrated fruit. These factors and fruit quality vary with areas of production. Grapes give a superior raisin when harvested with a minimum sugar content of 23 percent. Prunes should be harvested several times to avoid orchard deterioration. Pears are adversely affected in storage characteristics and quality by hormone spray treatments. Walnuts are harvested early and treated with ethylene gas to obtain a light colored meat. He noted that pretreatments are changing. Prunes are now being merely washed in cold water to remove surface dirt and grapes are dipped in lye solutions. Clingstone peaches are being peeled on a small commercial scale, and all cut fruits except apples and persimmons are being blanched. Sulphuring of blanched fruits after predrying at 180 deg. F. for about 40 minutes shows advantages over sulphuring immediately after blanching. To avoid heat damage during dehydration, he recommended that fruits susceptible to heat damage be

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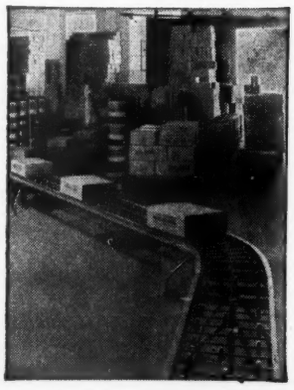

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dried to a higher moisture content than previously dried. Storage temperature, moisture content, $SO_2$ content and predrying treatments have been found to affect the storage life of dehydrated fruits. In some instances 5 to 8 percent moisture content results in greatest storage deterioration and 28 to 30 percent moisture content results in greatest storage deterioration; 23 to 24 percent moisture results in higher storage deterioration than 28 to 30 percent moisture content.

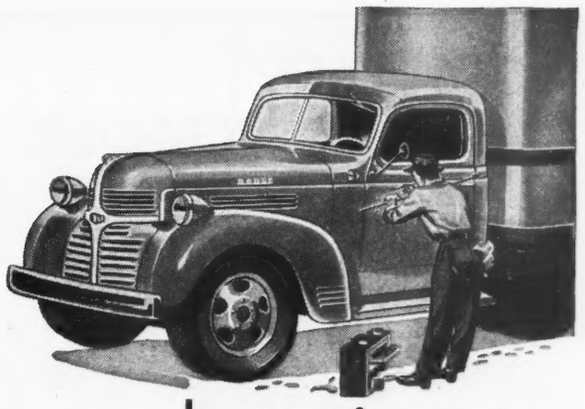
### Drying Orange Juice

Capt. E. M. Kenyon, Q.M.C. Food Technology Laboratory, M.I.T., reported an experimental process for making powdered orange juice on a continuous basis. The orange juice is concentrated to 63 percent total solids, without heat damage, preliminary to exposure to vacuum of 1.2 mm. mercury pressure, on a stainless steel belt inside a large horizontal steel tank. The high concentration of the juice avoids ice crystal formation during exposure of the juice to the high vacuum. Heat is applied by banks of infra-red lamps within the tank and 12 to 15 in. from the belt. The moisture content of the powder is reduced to less than 2 percent at the production rate of 3 lb. per hour. The stainless steel belt has a thickness not exceeding 1/16 in., has an effective drying surface of 5.2 sq. ft., and is equipped with a "doctor" or scraper blade, which removes the powdered juice at the end of the drying cycle for packaging in sanitary cans in the closed system under vacuum.

### Coop Marketing

Charles W. Hauck, Ohio State University, reported on a cooperative marketing research project between Ohio Agricultural Experiment Station and the Great Atlantic and Pacific Tea Co., in Columbus. The project is to study the possible reduction in wastes and losses of fresh fruits and vegetables by means of prepackaging and refrigeration. Average monetary savings in the trimming, handling and damage costs are reported to be in the range of 20 to 25 percent, which help to balance the cost of packaging and refrigerating. Other reported advantages are retention of crispness and nutritive values and an increase in sales volume per store. The fresh fruits and vegetables, after trimming, are cooled to 40 deg. F. and packaged in transparent wrapped and sealed consumer units, delivered cool to the retail stores, and sold from open top, self-service refrigerated cases.

## FOOD PROCESSORS SAY:



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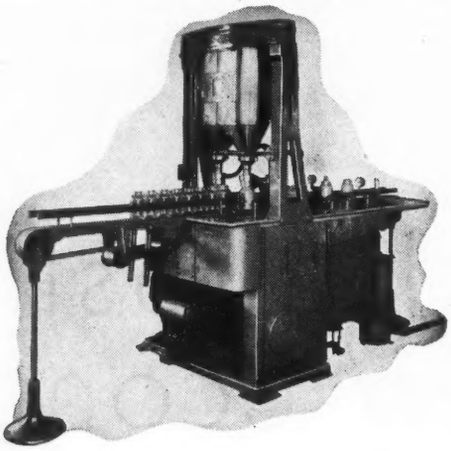

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Major M. E. Highlands, Q.M.C. Subsistence Research and Development Laboratories, reviewed the development of dehydrated foods and the role they played in feeding the Armed Forces. Emphasis was placed on the development of methods and procedures, on methods and means of protective packaging and on the increase in variety, palatability, and retention of nutritive values as the work of the Laboratory progressed.

Clarence Birdseye, Gloucester, Mass., reported on the development of his anhydrous process, the details of which appeared in FOOD INDUSTRIES, December, 1945, p. 80.

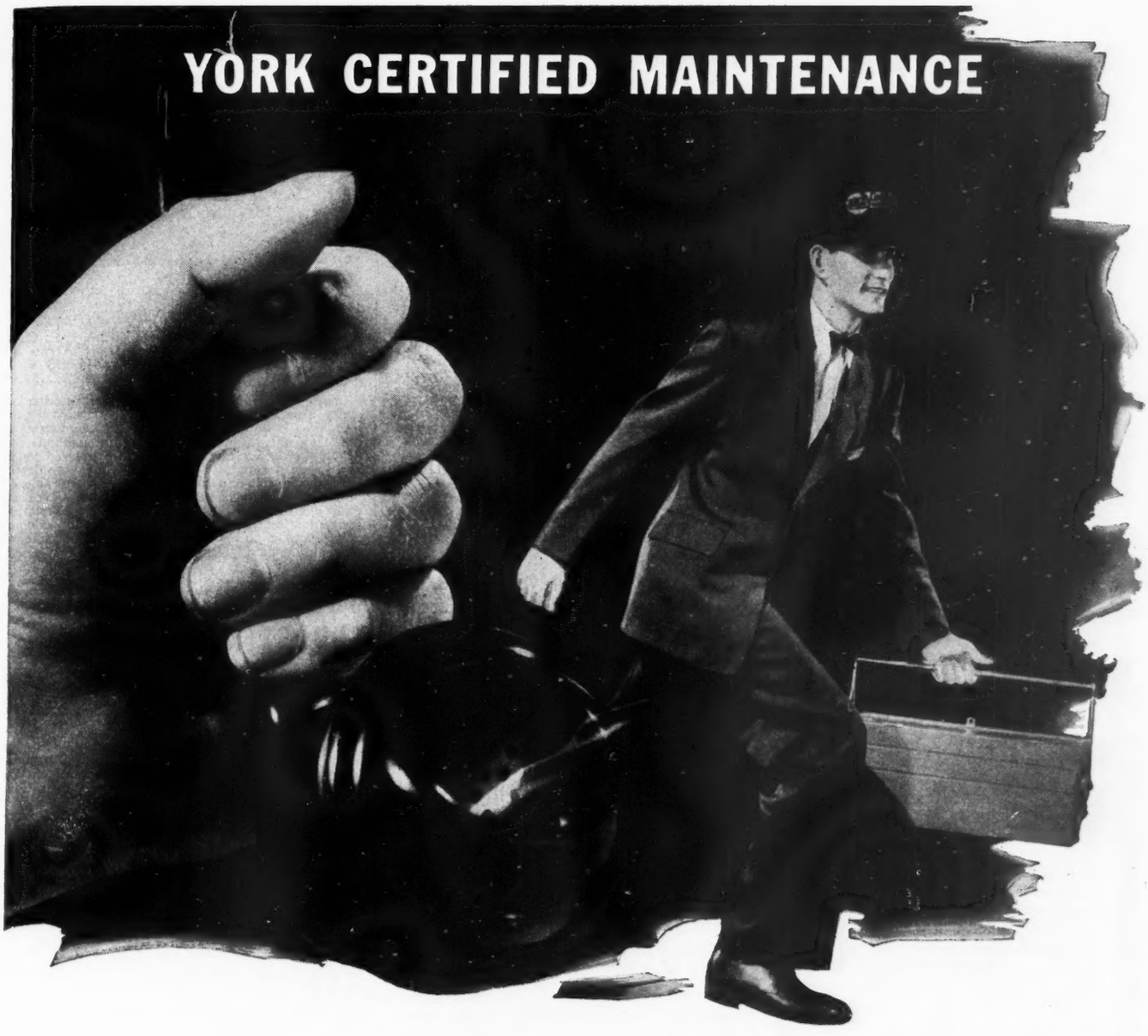
### Freezing Problems

The first discussion in the session on frozen foods brought out some of the problems in precooked frozen food production as seen by C. F. Evers, Birds Eye-Snyder Corp., who declared that sanitation measures must be much more exacting in this field than with some other methods of food preservation. In canning, as an instance, retorting gives a 100 percent bacterial kill, but this is not the case with frozen foods. The "growing of flavor" phenomena must also be considered in freezing. In the case of spices, for example, flavor becomes more intense as the precooked frozen foods are kept in storage. The reverse has been found in the case of salt and onion flavor. He also called attention to the fact that the packaging needs of this industry are generally unknown, as yet.

Two great needs were seen by G. A. Fitzgerald, Frozen Food Foundation, in his talk on quality control. One was the necessity for setting up raw material standards and the other rigid plant sanitation. He urged the extension of the present raw materials standards so that all such materials will be on a graded basis. Some of the factory cleaning devices suggested were continuous sprays of treated water onto all contacting surfaces and the ultimate elimination of certain types of rubber belts and fiber tubes, replacing them with hard surfaced materials such as stainless steel. He further advocated special cleaning crews, whose sole job is the cleaning of the premises and equipment.

### Poultry Tests

In order to properly classify eviscerated poultry for freezing, both subjective and objective tests were recommended by G. F. Stewart, Iowa State College. Determination of such factors as the age of the bird and the time retained in cooler and storage are important, as are mechanical shearing and organoleptic

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tests for tenderness and use of a pressometer to determine the amount of juice present.

D. F. Fisher, USDA Beltsville Laboratory, brought a related problem into the session with a discussion of transportation of fresh fruits and vegetables. He warned against overloading of refrigeration cars, which might choke the airflow, thus resulting in spoilage due to uncontrolled temperatures. He noted that body icing of vegetables in transit frequently improves the flavor, probably because product dehydration is reduced and because the lower temperatures are reached very much quicker.

### Proper Packaging

Four major points were outlined by A. P. Dearing, Packaging Institute, Inc., in his talk on the choice of proper packaging for frozen foods. The package, he said, must protect the product against vapor and bacteria infiltration, it must be strong enough to withstand ordinary handling, it must be nontoxic and noncrystallizing at low temperatures, and it must be economical. He also urged that the IFT recommend packaging standards.

Simplified modern methods of conveying, brining, washing, siruping and precooling commodities for freezing and preserving were discussed by M. P. Vacussovich, Gorton-Pew Fisheries, who described a new apparatus for brining such commodities as fish, fish fillets, shrimp, oysters, clams, scallops, pickles, fruits and berries and, in fact, any comestibles that require pickling or washing. He said the same apparatus may be used for siruping fruits and vegetables prior to freezing. Built of stainless steel throughout, the apparatus washes the material and separates from foreign particles through a flume operation. The product is then precooled and delivered to any desired place for final processing. It eliminates belt conveyors in the process of siruping or salting.

### Foreign Operations

In opening the session on foreign food observations, Col. R. A. Isker, recently resigned as commanding officer, Subsistence Research and Development Laboratory, revealed the Army's complete lack of preparedness in 1941, when it became necessary to feed large numbers of troops in overseas combat.

George E. Carlin, Swift & Co., revealed that the Germans cured ham for their armed forces by using about 25 percent of sodium benzoate

*3 McGraw-Hill Books of Interest*

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## FLAVOR

By E. C. Crocker, Arthur D. Little, Inc., Cambridge, Massachusetts. *McGraw-Hill Series in Food Technology.* 172 *pages,* 5½x8½, 33 *illustrations* .....$2.50

A convenient reference source of information on every aspect of flavor and taste. Contains a philosophy of flavor perception, the chemistry of flavoring agents and condiments and methods for developing and retaining flavor in processed foods and other products as well as methods for detection, correction and prevention of undesirable or "off" flavors in commercial products. Gives an odor classification system, indicating the relative concentration of the four types of odor components, and contains a new and enlarged table of volatile chemicals used in flavoring.

## THE CHEMICAL PROCESS INDUSTRIES

By R. Norris Shreve, Professor of Chemical Engineering, Purdue University. *Chemical Engineerign Series.* 957 *pages,* 5¾x8¾; 256 *illustrations* .....$7.50

Present-day teaching trends in chemical engineering are reflected in this important book. Offering a definitely new approach, the author follows modern factory practice in breaking down the actual industrial procedures into unit operations and unit processes, not only in the flow sheets, but in the supplementary text as well. An excellent one-volume treatise for anyone who wants to know how the products in the field are manufactured, the book presents a wealth of flow sheets, integrates chemical processes and unit physical operations, and covers modern advances in the field.

## GOING INTO BUSINESS FOR YOURSELF

By O. Fred Rost, Editor, Electrical Wholesaling; Marketing Editor, Business Week; Director, Surveys of Distribution, McGraw-Hill Publishing Company, 344 *pages* 5½x8, 19 *illustrations*..$3.00

A practical, readable manual to help the reader start his own business with the best possibilities for success, no matter how little his experience. Covers all the major aspects of what it means to start your own business, what tangible and intangible assets are required, and gives many pointers on choosing the right type of business, legal and financial problems, and methods of locating, organizing, and operating the business. Gives important information applicable to starting *any* kind of retail store or small service shop; discusses essential guides and the opportunities for success in over 20 specific small businesses.

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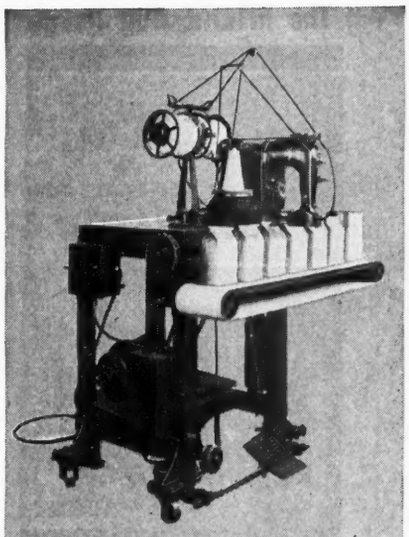

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in the pickling. This accounts for the fact that certain German hams did not require refrigerated storage. In making substitutes for meat during the war in Germany, sulphite liquor, after pretreatment, was fermented with *torulae* to make a product that was not well liked. On the other hand, *Oidium lactis*, a mold, resulted in a product of creamy color and good flavor that was liked better than debittered brewer's yeast. He also reported on two continuous butter processes that were discovered in Germany.

### Baking Discoveries

European cereal and baking operations were illustrated and explained by Dr. C. G. Harrell, Pillsbury Flour Mills, and Dr. R. W. Pilcher, American Can Co., described the findings of several investigators in German wartime food processing and packaging operations.

Contrary to the usual American method of operation, according to Dr. Pilcher, the German food dehydrators were mostly small operators. Most of them canned and froze foods as well as dehydrated them. One method used to overcome their tin shortage was to make a black iron can with welded seams and with one outside coat of enamel and two inside coats. On this "Sela" can the enamels could be baked at much higher temperatures with welded cans than they could with soldered cans. Low temperature can-closing led to many technological difficulties in Germany, and small operators were satisfied if the spoilage did not run over 10 percent. On the other hand, all warehouses were quite cool, due to the northern climate. These warehouses, together with the rapid turnover—less than seven months—brought a great deal of food into consumption that might have otherwise spoiled.

### Special Studies

In the Wednesday afternoon session, given over to special research discussion, Lawrence P. Geer, Prime Products Co., reported on the degradation and removal of pectin content of fruit and vegetable juices to permit dehydration to about 2 percent moisture without caramelization of sugar content or destruction of natural color and flavor. The resulting product is suitable for molding into a hard-candy-like confection, to be consumed as such, or may be used as the basis for a beverage or flavoring material by reconstitution through the addition of water or a liquid containing water. The pectin content of the juice is degraded or

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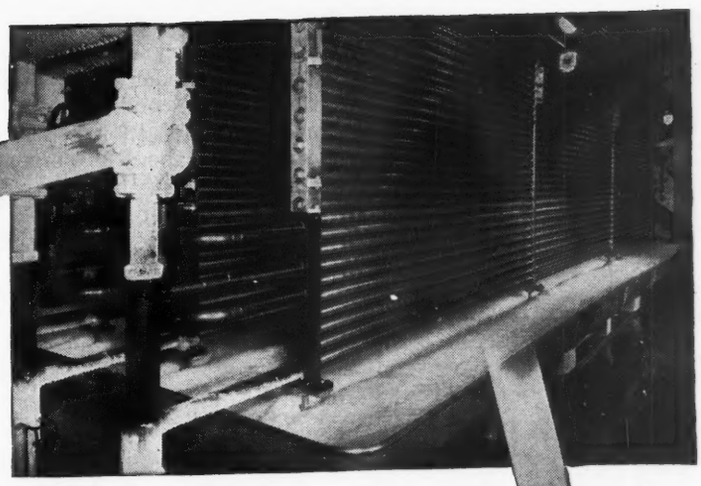

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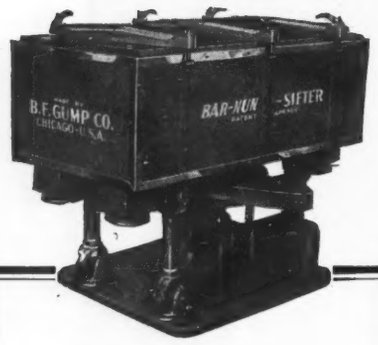
### Tomato Flakes

D. K. Tressler and co-workers with Sardik Co. reported their work on drum-dried tomato flakes to determine relationship between moisture content and quality retention during storage. The flakes contained 1, 1½, 2½, 3½ and 5 percent moisture. They were packed in nitrogen in tin containers and stored at 40 deg. F., 65-80 deg. F., and 100 deg. F. Tests were made after 1, 2, 4, 8, 16, and 32 weeks storage for palatability, vitamin C content, $CO_2$ production, increase in moisture content, caking, color changes, and dehydration properties. All samples for 32 weeks, at 40 deg. F., retained their original quality. That containing 5 percent moisture "caked" after two weeks. Samples with 1, 1½, and 2½ percent moisture retained their quality satisfactorily, but with about 10 percent loss in ascorbic acid when stored at 70 deg. F. for 32 weeks. That with 2½ percent moisture liberated $CO_2$. Those with 3½ and 5 percent moisture "caked" hard, liberated $CO_2$ and lost 16-30 percent of their ascorbic acid. Sample with 1 percent moisture retained its quality except for about one-third its vitamin C at 100 deg. F. for 32 weeks. That with 1½ per cent moisture decreased from "good" to "fair" palatability. Those with 2½, 3½, and 5 percent moisture were "poor" in quality within a 4-week period at 100 deg. F.

A moisture content of not more than 3½ percent is recommended for long storage at 40 deg. F.; 1½-2½ percent for 65-80 deg. F., and not more than ½ percent for 100 deg. F.

### Grape Gels

G. L. Baker and co-workers, with Delaware Agricultural Experiment Station and American Preserve Co., reported results of a study on grape gels containing 30 percent soluble solids made with low-ester apple and citrus pectinates over 17 months. Gradual flavor and color changes were found accompanied by considerable change in gel strength and melting temperature. Gel strength increased to the state of brittleness with loss of elasticity. Melting temperatures increased. Analysis of the pectinates showed demethylation.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